A DOMICILIARY INVESTIGATION OF CHILD DEVELOPMENT IN GLASGOW

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PREFACE

The main part of this work was accomplished while I was a Research Fellow in Child Health at the University of Glasgow and a member of the Social Paediatric Research Group. It was supported by a grant from the Children's Research Fund.

I am most grateful to Professor J. H. Hutchison, Professor of Child Health, University of Glasgow, and Dr. I. D. G. Richards, Director of the Social Paediatric Research Group, for their help and encouragement during the course of this work.

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I am grateful, too, to the Health Visitors of the City of Glasgow, who willingly provided me with any help or information requested. The co-operation and interest of the mothers whose children were included in the study, not only made the work possible but also made it pleasurable for the investigator.

E. White.

BRISTOL, October, 1972.

SUMMARY

Two samples of normal Glasgow children were visited, in their own homes, at intervals during their first year of life. At each visit, a physical and developmental examination was performed and at the first visit, basic social and obstetric information was obtained from the mothers. Further details of the obstetric history were obtained from the birth and hospital records.

Developmental scores were later compiled from the records of the developmental testing. These scores were used to examine the relationship of various obstetric and social factors with developmental progress during the first year of life.

Statistically significant relationships were found between the developmental scores and social class, family size and the number of children in the family who were less than five years of age. With the exception of birth weight and length of gestation, no consistent relationships were detected between the developmental scores and the obstetric factors studied, when allowance had been made for the effect of the number of young children in the family on the scores obtained.

INTRODUCTION

DEVELOPMENTAL PAEDIATRICS

Developmental paediatrics has the misfortune of being a 'fashionable' subject at the present time. Professor Illingworth has said recently (1972) that "Many have the urge to assess every baby without knowing they are doing it, how to do it, or what they are doing."

If the only purpose of studies in child development was an increase in the abstract knowledge of the subject, such studies would be unjustifiable. It would be difficult to equate the knowledge gained with the inconvenience or, occasionally, discomfort caused to the children and their parents and the possible anxiety aroused in the parents. Practical reasons for the study of child development are of two types, individual and community.

For each child as an individual, it is important that any abnormalities or handicaps can be detected as early as possible in the child's life; studies which chart the course and span of normal development will enable doctors and other workers to detect deviations from normality. Developmental assessment is not an end in itself but a means to determine whether a child has neurological, physical or developmental defects which are sufficiently marked to need special care or treatment at that point or at some future date.

At the community level, the aim is the prevention of handicap, disease and abnormality wherever possible; studies which help to identify the causative agent or agents of such a condition would help to accomplish this.

Sheridan (1968) placed the items included in her chart of developmental progress in four separate sections:

Motor - involving body postures and large movements;

Vision and Fine Movements - involving visual competence and manipulative skills.

Hearing and Speech - involving auditory competence and the use of speech and language codes.

Social Behaviour and Play - involving competence in the organisation of the self and increasing voluntary acceptance of satisfactory social standards with regard to personal relationships and cultural usages.

Gesell and Amatruda (1947) also give four areas of development: Motor, Adaptive, Language and Personal-Social. The Motor area includes some of the fine motor skills of manipulation and the gross motor skills of posture and large movement. Other fine motor items are included in the Adaptive and Personal-Social areas. A screening test, based on Gesell's Norms of Development, (Knobloch et al., 1966) regroups the items into five areas: Adaptive, Gross Motor, Fine Motor, Language and Personal-Social.

Most workers consider developmental progress under four or five headings, similar to those of Gesell and Sheridan. With the possible exception of gross motor skills, few actions can be regarded as completely within the areas of social, language or fine motor skills and there is considerable variation between scales, in the items included in each area.

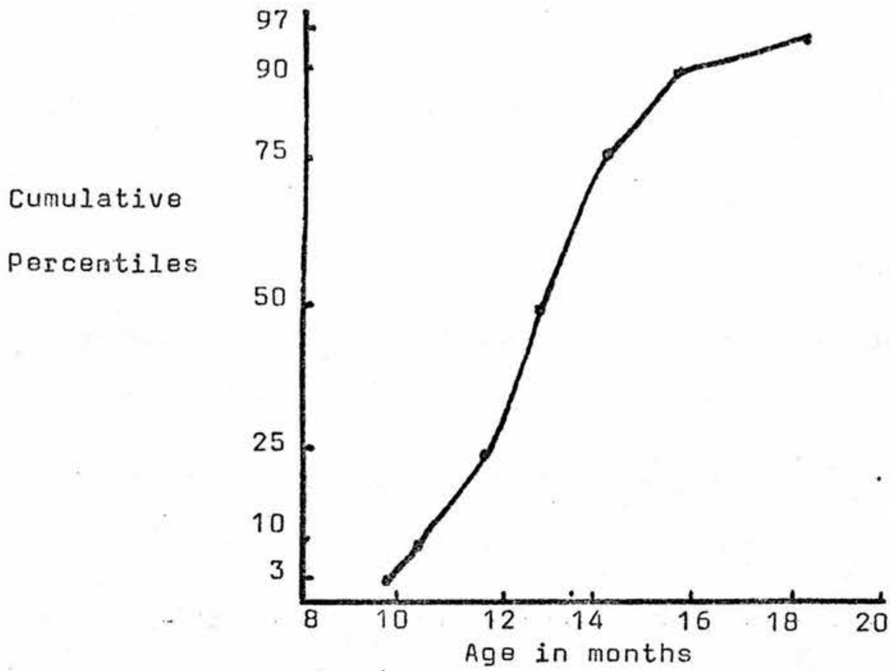
There is at present little accurate information on the course of development of most major abilities in children and, although there are some generally accepted norms for the "average" level of achievement, little is known of the span of normality (White, 1969; Sheridan, 1972). Considerable evidence does exist to show that the 'average' has no practical value when applied to biological attributes such as height and weight (Tanner, 1970). In the acquisition of motor and mental abilities the average may be even less meaningful.

Neligan and Prudham (1969) collected information on the development of four basic skills in Newcastle children; the skills chosen were those of sitting unsupported, walking unsupported, and the acquisition of single words and sentences. In each case, it was found that an 'S' shaped curve was produced when the age was plotted against the cumulative percentiles of the age of achievment of the skill. This curve showed a marked skewing of the upper tail so that the age difference between the 97th and the 50th percentiles was approximately twice the age difference between the 3rd and the 50th percentiles (Diagram 1). This data was obtained in a longitudinal study and agrees with the findings of Frankenberg and Dodds (1967), in a cross-sectional study, but the Denver children appear to master these 4 skills at an earlier age than the Newcastle children. Their results were presented in the logical and useful form of bar charts which showed the ages at which 25%, 50%, 75% and 90% of the children observed acquired various skills, to form the Denver Developmental Screening Test (Diagram 2).

Considerable regional variations were shown in the achievement at the age of 7 years in the Report of the National Child Development Survey (Davie et al., 1972). This may mean that tests and schedules compiled in one country, or even one area of a country are of limited value elsewhere.

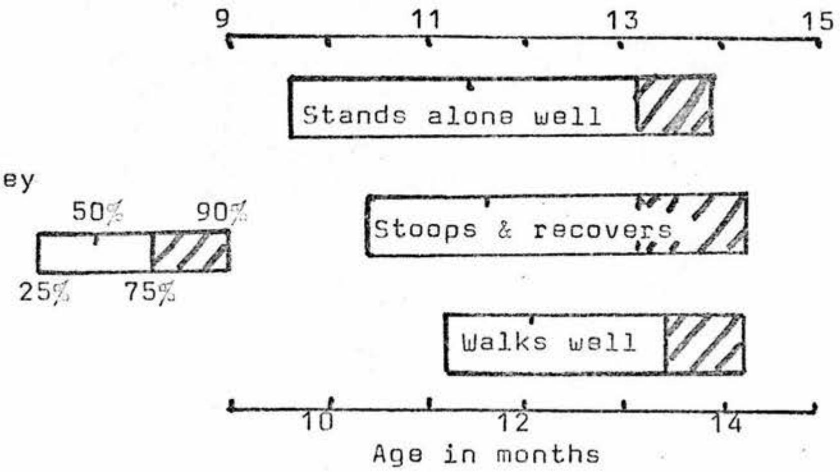
Changes in the development of the children themselves may also affect the sensitivity and usefulness of developmental scales developed

DIAGRAM 1



Cumulative percentile curves for 'milestone' of walking unsupported. (From Neligan and Prudham,1969)

DIAGRAM 2



Age distribution of children performing three of the test items. (From Frankenberg and Dodds,1967) almost 50 years ago (Gesell, 1925). True changes in performance levels on these scales could result from changes in child rearing practice. It has been shown that the developmental or intelligence quotient of a child may be related to his height and weight (Douglas, 1969; Grantham-McGregor and Back, 1971). The trend for children of today to be larger and heavier than their parents were, may be reflected in increased developmental and intelligence quotients being obtained on testing with scales based on the achievements of their parents' generation.

DEVELOPMENTAL SCALES AND SCHEDULES

Sheridan (1972) has said that developmental paediatrics should be concerned with the maturational processes, from foetal viability to full growth, of both stucture and function in normal and abnormal children; this is a very wide brief. To obtain even an outline sketch of normal development, children, both as individuals and in groups, must be carefully observed to detect the changes which indicate physical, psychological and emotional development and maturation.

Charles Darwin was an acute observer, fascinated by all aspects of nature, including the growth and development of his own children. Like other early observers (Taine, 1877; Moore, 1896; Mrs. W. S. Hall, 1896), most of his work in this field was composed of intense, personal observations of his own children (1877). His interest in child development did not remain at this personal level. He investigated the facial expressions of crying infants in some depth; his interest in this caused him to circulate printed enquiries among psychologists, physicians and missionaries, both in Europe and further afield. His approach was comparative; he was interested not only in the reactions of the young of all races but also in those of the young of all primates.

In America, Darwin's "The origin of the Species" (1859) provoked law-suits and scandal, but it also stimulated the more thoughtful scientists. Many of them began to approach problems along new lines; G. Stanley Hall applied the concepts of evolution to the mind of the child and the race. Hall and others set up a nationwide child study movement which attempted to carry out scientific studies in child development (G, Stanley Hall, 1883) and helped to liberalize elementary education in

America.

In Europe, Preyer and others were observing children in a scientific manner (Preyer, 1882) and in Britain, Sully (1896) was working on similar lines.

At the beginning of this century, psychologists begain to publish the first practicable intelligence tests. The Binet-Simon Scale first appeared in 1903 but that form of the test contained few items relevant to young children. It was extended to cover younger children, down to 3 months of age, byKuhlmann (1922). Since then, it has been extensively and repeatedly revised and its modified forms (Stanford-Binet and Terman-Merrill tests) are used extensively in the examination of older children today.

Developmental testing of the very young child, as it is practiced today, probably began in 1925. In that year, Arnold Gesell published a short article on "The Monthly Increments of Development in Infancy". His basic thesis, that functional tests of behaviour can be used to assess the maturity and integrity of a child's central nervous system, is widely accepted today and is the foundation on which the discipline of developmental paediatrics has been built. Gesell insisted that "quotients" have little meaning in child development; it is probably wiser and of more value simply to assess the functional or maturational age that the child has reached at the time when the examination is performed.

Since Gesell's preliminary publication in 1925 and the book which followed it in 1927, numerous developmental tests and schedules have appeared. These include thos of Stutsman (1931), Bayley (1933), Buhler

(1935), Cattell (1940,) Illingworth (1953 and 1963), Griffiths (1954), and Sheridan (1960 and 1968). Many such tests and their modified or shortened versions, intended for use as screening tests (Knobloch et al., 1966: Frankenberg and Dodds, 1967), are based on Gesell's schedules. During the last twenty years, tests of neurological function and development, particularly in the neonate, have been introduced (Andre-Thomas et al., 1954, Paine, 1960, Prechtl and Beintema, 1964).

Gesell's paper of 1925, in which he first outlined his developmental schedules, was based on examinations of only 28 children. These children were seen in pairs of monthly ascending age, on consecutive days at his clinic. Their ages ranged from one to twelve months and they were considered by Gesell to be of superior intelligence and all of "similar calibre". This work was later standardized on 50 different children in each age group (Castner, 1932) and a further group of 90 children were "treated as a series" (Gesell, 1939), not all the children being seen at each examination. The Developmental Screening Inventory, developed from Gesell's schedules by Knobloch, Pasamanick and Sherard (1966) is probably the version of Gesell's scale most commonly used today.

Bayley (1933) followed 61 children longitudinally over a period of three years. She saw them at a clinic at monthly intervals for the first fifteen months of life and at intervals of three months until they were 3 years old. The developmental testing procedure used was based on the work of Gesell and others. An assessment of individual and group growth was possible in this study. The sample was not representative of the community from which it was taken; the mothers were included in the study group only if they were willing to co-operate by attending the clinic regularly, on the specified dates, and the sample proved to be superior to the population of Berkeley, California, in both social class and education.

Recently (Bayley, 1965) the scale was standardised for the one to 15 month age group; 1409 children, 80 to 120 in each monthly age group, were examined. Their parents' income and education level was representative of Berkeley as a whole. Even so, when the Bayley Infant Scales of Mental and Motor Development were tested in England, (Francis-Williams and Yule, 1967), so many statistically significant differences were found between the American norms and the performance of the English children that the investigators considered that the scales could not be recommended for anything other than cautious research work on British children.

The Griffiths Mental Development Scale for testing babies from birth to two years, was developed and is extensively used in Britain (Griffiths, 1954). The items used by Griffiths in the compilation of this test are again taken mainly from Gesell's work. Items from other scales are also included. Additional items, frequently requiring interpretation of observed behaviour by the examiner have been inserted. The test schedule was administered to 571 children, in the age range of 14 days to 24 months. These children were selected mainly from clinic and day nursery populations; the largest number seen at any monthly age level was 31 and the social class distribution of the sample differed considerably from that of the areas involved and the country as a whole. Extensive statistical calculations were performed on the results of the tests, giving norms and standard deviations for levels of performance.

Both the Griffiths and Bayley test schedules are designed to provide a numerical score or quotient for each child examined; as the standardisation procedures employed in both test schedules may make them unsuitable for widespread use in British children, it would be unwise to allow a single test score to determine care or treatment in an individual case. However, consecutive test scores can be useful in charting the progress of an individual child. For survey purposes, some such scorable scale which would allow comparisons to be made is valuable.

Illingworth (1970) states that, in his listing of the Average Level of Development at Different Ages, he has combined with the milestones of development, a variety of simple developmental tests "...mainly culled from Gesell". Sheridan too, has taken the basic items for her Developmental Progress Charts from Gesell, with additional items from Stutsman, Buller, Doll and Cattell (Sheridan, 1968). Both these authors have estimated the normal or average ages at which the various milestones are reached and developmental testing procedures completed successfully by the normal child on the basis of their own clinical experience; this was in one case gained mainly in a Teaching hospital and in the other, in the observation of large numbers of children, both normal and handicapped in nurseries and clinics throughout Britain. In both cases, the proportion of completely normal children is likely to have been lower than the proportion in the community as a whole. Sheridan insists that her work has grown from the handicapped child towards the normal one. (Sheridan, 1971).

These authorities have produced abbreviated forms of their assessment of the no mal developmental progress of the child (Illingworth, 1962; Sheridan, 1971). These have proved of value to all doctors in their routine work with young children. They both recommend that children should not be graded numerically in a developmental assessment but should be assessed simply as having failed to reach, reached, or passed the developmental level expected from normal children of that chronological age group. Their assessments are designed to be interpreted by individual doctors in the light of their own clinical experience. Used in this was they form valuable diagnostic tools; but, as they have not been standardized on a normal population, it is possible that they are inefficient as a screening tool and may either leave abnormalities undetected or cause needless worry to parents by assessing a normal child as retarded.

In 1964, Calder and Drachman pointed out that despite the general influence of Gesell, his full developmental schedules are rarely used. They attributed this mainly to the length of the scales which make them impractical for routine use by the paediatrician and the comparatively loose standardisation of the scales which makes them unattractive to the psychologist. They devised their own screening test from items from Gesell which were practicable in their clinical situation. They considered that the results obtained when using this test were well correlated with those obtained from two other tests used by them, namely the Cattell Infant Intelligence Scale and the Griffiths test. Only 39 children whose ages ranged from 6 months to 2 years were studied in this series.

In 1966, Knobloch, Pasamanick and Sherard published the Developmental Screening Inventory (D.S.I.), quoted above. They considered that this test, when given by relatively unskilled personnel, was an adequate screening device; the results of 58 screening inventories, administered by medical students having matched well with the results of full developmental testing, administered by a paediatrician. Unfortunately, the D.S.I. has internal inconsistencies. For example, the same item

"Plays nursery trick" appears twice at the same age level of 40 weeks; in the Language area it appears as "Plays nursery trick if asked", a more mature form of behaviour than "plays nursery trick only if you do it first", which appears inthe Personal-Social area.

The Denver Developmental Screening Test of Frankenberg and Dodds appeared in 1967. It was standardised on a total of 1036 children. However, the number of children in any one age group are small and their social class distribution was not representative of Denver. The test instructions were revised by the same authors in 1971 as they found that in its original form, too many normal children were suspected of being slow in their developmental progress.

Milani-Comparetti and Gidoni (1967) produced an original form of chart for the recording of gross motor development, which incorporates a scale of normal development. No details have been given by the authors of how they arrived at these norms. They say only that "This chart has been developed over 5 years experience in regular weekly sessions in a child welfare clinic...".

The charts produced by Zdanska-Brinken and Wolansky, (1969) also depict gross motor development. They incorporate the results of monthly examinations, by one examiner, of a series of 212 children seen in 2 Warsaw clinics, from the age of 4 weeks until they were walking alone.

The use of a questionnaire, administered by Health Visitors as a screening mechanism has been investigated by Ferrer (1970). The Mothers of 8 children at each age level, 8 weeks apart were interviewed and the children subsequently examined. He selects 17 of the original 32 milestones investigated as forming a reliable screening questionnaire. A similar investigation, where public health nurses used a questionnaire to inverview the mothers of a sample of over 400 children aged around 40 weeks, was carried out by Knobloch and Pasamanick (1955). The use of such a questionnaire was shown to be unreliable as a screening procedure when compared with a full developmental examination by a paediatrician.

"Neurological Schedules" have not been produced in the same abundance as the general developmental schedules. Andre-Thomas and St, Anne Dargassie have amassed a great deal of data on the neurological development of the infant and have published a schedule similar to those of Sheridan and Illingworth on general development (St.Anne Dargassie et al., 1960; St. Anne Dargassie, 1972). Prechtl and his colleagues have carried out extensive scientific studies of the neonate. His testing procedures are strictly regulated and the child's reactions are quantified to provide a scoring system. (Prechtl and Beintema, 1964).

Paine (1960) provided useful guidelines for the neurological examination of the infant and child, including approximate age ranges for the disappearance of neonatal reflexes and the appearance of the more mature reflexes. In 1964, he published the results of a study in which a group of normal children were followed from the age of 6 weeks to one year, to obtain further information on the reflex behaviour of normal babies.

A useful outline schedule for the neurological examination of the infant was produced by a Working Party of the World Health Organisation in 1966. This schedule allowed the test to be scored and it forms a practical guide for survey work or serial assessment of an individual child, where a scoring system is necessary to allow comparisons to be drawn.

REPRODUCTIVE CASUALTY

The diseases and complications of pregnancy and delivery have been accepted causes of stillbirth and neonatal death since ancient times. In the nineteenth century the circumstances surrounding such deliveries were observed and recorded (Little, 1861). These suspicions and deductions have been confirmed by well conducted studies in the twentieth century, for example the British Perinatal Mortality Survey of 1958 (Butler and Bonham, 1963 and Butler and Alberman, 1969), the Newcastle Maternity Survey (Russell et al., 1963). In Aberdeen, many careful studies on pregnancy and delivery have been performed during the last thirty years and much valuable information produced (Baird, 1970).

The factors affecting perinatal mortality were discussed by a World Health Organisation Seminar in 1969. The report of this meeting lists the main factors thought to be responsible for perinatal mortality. These factors include:

(a) Poor socio-biological characteristics in the mother,

(b) Abnormal gestation periods, short or long,

(c) Low birth weight,

(d) Poor organisation and standards of obstetric and paediatric care.

(e) In the long run, poor levels of health in the population as a whole.

(W.H.O., Public Health Papers, 1972).

In 1853, Little suggested that some of these same factors, when they did not cause the death of the child, might cause lasting injury. In particular, he indicated that premature birth and difficult labour might cause cerebral palsy. (Little, 1961). However, in 1897, Freud criticized

Little's theories. He considered that perinatal difficulties were also the result of factors causing the cerebral palsy, and that the basic defect was developmental. Since that time, both of these hypotheses have had their supporters. Today, it seems that both may be at least partially correct.

The existence of a "continuum of reproductive wastage" was first postulated by Lilienfeld and Parkhurst (1951). They traced the birth records of 581 of 735 cases of cerebral palsy, obtained from the New York State Department of Health Case Index. All the children whose records were traced were born during the period 1940-1947 and were aged 1 to 7 years at the time of the Survey. Lilienfeld and Parkhurst compared the information available on these 581 births with that for the total population of New York State. It was necessary, for some comparisons, to select groups of births from different years, depending on the availability of the material. They concluded that the factors strongly associated with perinatal deaths, namely prematurity and the complications of pregnancy likely to lead to anoxia in the foetus, were also associated with cerebral palsy. They suggested that there might be a "continuum of reproductive wastage" with lethal and sublethal manifestations.

Since 1951, Lilienfeld and Pasamanick and, latterly, Pasamanick and Knobloch and their co-workers have completed retrospective studies on groups of children with other handicaps (Pasamanick and Knobloch, 1966); the continuum is now described as one of "reproductive casualty", ranging from death through varying degrees of disability, to the syndrome of minimal cerebral dysfunction. Each of their studies has followed the general pattern of that of Lillienfeld and Parkhurst described above, with cases selected from case registers or hospital records, and the birth records sought and compared with controls from the population into which the study children were born. From these surveys, the authors considered that they had found significant associations with prematurity and complications of pregnancy in 8 conditions; cerebral palsy (Lilienfeld and Pasamanick, 1955), epilepsy (Lilienfeld and Pasamanick, 1954), Mental deficiency (Pasamanick and Lilienfeld, 1955), behaviour disorders(Pasamanick, Rogers, and Lilienfeld, 1956), reading disabilities (Kawi and Pasamanick, 1958), the occurence of strabismus, hearing defects, or childhood autism (Pasamanick and Knoblock, 1966). They also found that tics seemed to be associated with complications of pregnancy, but not with prematurity and that childhood speech disorders, when not associated with cerebral palsy or mental deficiency, showed no significant relationship with either prematurity or abnormalities of pregnancy. The complications of pregnancy implicated by these studies were toxaemia and ante-partum haemorrhage; no difference was found between cases and controls in the incidence of prolonged and difficult labour or of operative procedures during delivery.

Knobloch and Pasamanick have also followed a group of 500 prematurely born children and 492 full term, matched controls for a period of 3 years, with two developmental examinations during that period. They found an association between the degree of prematurity and the degree of neurological impairment and incidence of behavioural disorders in 3 year olds, and that development and, later, intelligence quotients, are influenced by social factors. (Knobloch and Pasamanick, 1960 and 1961; Pasamanick, 1963).

With over 30 publications during the last 15 years, Knobloch and Pasamanick must be among the most prolific in this field, but many other workers have been engaged on similar studies.

PREVIOUS INVESTIGATIONS.

Both retrospective and prospective methods have been used to study the relationship between perinatal factors and subsequent development. As in the studies performed by Knobloch, Pasamanick and their colleagues, a retrospective enquiry begins with the affected children and information on the events of pregnancy and the perinatal period are obtained from the existing records. The control group used in such a study may be specially selected or may comprise the total population in which the cases were observed. The incidence of possible harmful factors in the histories of both cases and controls is then compared. Although there is little wastage in such studies, the information available in the records may be incomplete and it is difficult to detect or assess any bias which may be present in the selection of case and control groups. However, when a rare condition is studied, a very large sample would be required in a prospective survey to ensure that sufficient cases occurred to enable comparisons to be made; as a retrospective study begins with the cases, it may be preferable in these circumstances.

In a prospective enquiry, which may extend over several years, bias may be introduced by the loss of subjects from the sample by removal from the area or non-co-operation. However, the extent of such a bias is known and it may be possible to make some allowance for it in the calculation of results. The original sample can be clearly defined and it is easier than with a retrospective enquiry, to ensure that both cases and controls are representative of the population from which they are drawn. An additional advantage is that, as the number of persons at risk in each group is known, the incidence rates of events subsequently observed can be calculated and compared.

A major drawback in prospective studies is the relatively long period which must elapse between the selection of the sample and the collection of the follow-up information. This can be reduced if a population can be defined at any specific time and then the subsequent events noted. For example, if complete obstetric records are available in a particular hospital for a year, perhaps 5 years earlier than a study is commenced, it may be possible to identify all those children in which some particular complication arose and examine their progress at the age of 5 years. Control groups could also be selected from the same population.

In some circumstances, it may be useful to make a small retrospective enquiry before beginning a larger, more time consuming, prospective study. Neither method of enquiry can provide "proof" of cause and effect; all that can be obtained is evidence that an association exists between various events or conditions. The most reasonable interpretation of such associations must then be sought.

The reported studies of the relationship between perinatal factors and subsequent development can be divided into four groups:
Type I - Retrospective studies. A group of children with neurological or psychological defects are selected and their birth records traced.
Type II - Prospective studies where children with neurological trauma or symptoms at birth are identified and their subsequent development observed.
Type III - Prospective studies where complications of pregnancy and the perinatal period are noted and the subsequent development of the surviving children observed.
Type IV - Prospective studies where the clinical events during pregnancy and the perinatal period are observed on a series of children, the outcome of the pregnancy noted and the development of the surviving children

observed.

In studies of Types I, II and III, there may be a control group, possibly matched with the cases for certain variables. In some of the Type IV studies, the children observed were representative of the population from which they were selected; in others the samples were biased, either by the selection procedures used or as a result of wastage from the sample during the course of the investigation.

TABLE I - Type I Studies - Retrospective

Authors	Source and Type of Sample	Sample Size	Conclusions
Barker and Edwards (1967)	Normal School Children	50,000	Nil Significant, Slightly impaired performance with short gestation, toxaemia and incréasing birth rank.
Barker (1966)	Educationally subnormal children	607	Nil significant.
Fairweather and Illsley (1960)	Mentally handicapped children	66	High incidence of obstetric abnormalities and low maternal intelligence.
Fuldner (1957)	Cerebral palsy	204	High incidence of obstetric complications.
Latham et al. (1954)	Cerebral palsy register	61	High incidence of prematurity, antepartum haemorrhage, and 'poor' condition at birth.

TYPE I STUDIES

The retrospective studies of Knobloch and Pasamanick have been discussed. Table I lists some further examples of this type of Study (Type I). In two of these investigations, no significant correlations were found between perinatal factors and school performance (Barber and Edwards, 1967) or educational subnormality (Barker, 1966). The sample selected by Fuldner (1957) consisted of 204 children whom he considered to have "infantile" cerebral palsy and whose birth records could be traced, from a group of 507 cerebral palsy referrals; the group traced included less than 40% of those referred. In this study and in those of Fairweather and Illsley (1960) and of Latham et al., (1954), a high incidence of obstetrical complications was found in the histories of the handicapped children studied. However, Fairweather and Illsley point out that, in their investigation, this was associated with low levels of maternal physique and intelligence and they considered that the direct contribution of obstetric factors was small.

TABLE II - Type II Studies - Progress of children with neurological abnormality, detected in the neonatal period.

Author	Sample Size	Seen	No., type & age at F.U. Examinations	Conclusions
Donovan et al (1962)	?	112	Once. N. 1 year	80% of those abnormal as neonates, normal at 1 year.
Prechtl (1965	336	285	Once. N. 2-4 years	Neonatal neurological signs of predictive value.
Rose and Lombroso(1970)	144	137	Once. D. 4 years	Neonatal neurological signs of little predictive value. E.E.G. better.
Rosenblith and Anderson (1968)	?	129	Once. D. 8 months	Discrepancy of limb muscle tension in neonate of predictive value.
Thelander (1956)	55	51	Once. N. 6-42 m.	90% of those abnormal as neonates were normal when seen.

Key:
F.U. - Follow-up
N. - Neurological examination
D. - Developmental examination
E.E.G. - Electroencephalogram

TYPE II STUDIES

Table II summarizes the results of five studies in which children with definite neurological abnormalities in the neonatal period were kept under observation (Type II). The findings indicate that, although children with abnormal neurological signs in the neonatal period are more likely to still exhibit abnormal signs until at least 2 years of age than are the normal controls, a large number of such children are normal at examination (Donovan et al., 1962; Thelander, 1956). It is possible that, although the abnormal neonatal signs disappear in early childhood, they may be replaced by less definite defects, for example, behaviour problems, in later childhood. Rose and Lombroso (1970) found that neonatal electroencephalograms (E.E.G.) proved to be better predictors of developmental levels at 4 years of age than neonatal neurological examinations.

TABLE III - Type III Studies - progress of children surviving known complications of pregnancy and the perinatal period.

Author	Sample Type	Sample Size	Sample Seen	No., Type and age at F.U. Examinations	Conclusions
Babson and Kangas (1969)	Short Gest. & low B.Wt.	51	43	Once.Ps. 4 years.	No difference detected
	Short Gest. with Normal B.Wt.	49	43		
Benaron et al (1953)	Prolonged labour and forceps delivery	80	47	Once. Ph. School placement. 5-15 years.	If survive neonal period no difference detected.
	Precipitate labour	80	45		
	S.V.D.	80	43		
Buck et al.	Labour complications	330	286	Once. Ps. School placement 5-6 years	Toxaemia was only perinatal factor related to performance.
	Pregnancy complications	324	206		
	Controls	?	?		
Campbell et al. (1950)	Asphyxia	89	61	Once. Ph. Ps.	No difference detected.
	Controls	178	134		

KEY: F.U. - Follow-up
Gest. - Gestation period
D. - Developmental examination
N. - Neurological examination
Ph. - Physcial Examination
Ps. - Psychological examination
I.Q.- Intelligence quotient
B.Wt. - Birth weight

Author	Sample Type	Sample Size	Seen	No., Type and age at F.U. Examinations	Conclusions
Conway and Brackbill (1970	General, local or no anaesthesia in labour	23	8	Twice. N.D. Neonatal and 4 weeks	No anaesthesia better than local, better than general at 4 weeks.
			15	x3. N.D. Neonatal, 4 and 20 weeks.	No difference at 20 weeks.
Creamer (1955)	Toxaemia	126	94	Once. Ph.D. 1-4½ years	No difference when allowance made for prematurity.
	Controls	?	74		
Culley et al. (1970)	Neonatal jaundice	?	Total 371	Once. Ps. 6 years	No evidence of ill effects if bilirubin not in excess of 20mg%.
		?			
Darke(1944)	Severe asphyxia	49	23	Once. Ps. 2-10 years	Relationship between low I.Q. and asphyxia.
Douglas (1956)	2500g or less B.Wt.	707	676	Twice. Reported from health visitors. 2yr.	Low birth weight children slower in walking.
	Controls	707	676		
(1956b)	Cases		407	Plus Ps. at 8 years	Low birth weight associated with lower I.Q.
	Controls		407		
(1960)	Cases		355	Plus school records	Low birth weight associated with poorer school performance.
	Controls		355		

Author	Sample Type	Sample Size	Seen	No., Type & age at F.U. examination	Conclusions
Drillien (1962)	Twin Pairs	110		x9. Ph. D. Birth-5years	Birth injury not aetiologically important. Low birth weight and low social class associated with low developmental level
	Prematures	256	Over 500		
	Controls	119			
	Total	595			
Eaves et al. (1970)	Birth weight less than 4½-lb.	502	351	x8. N.D.Ps. Birth-6years	Low birth weight associated with poor performance - this accentuated by low social class.
	Controls	?	207		
Graham et al. (1956 & 1962)	Anoxia	132		Twice. Neonatal-N. and 3 yr. -Ps.	Anoxia associated with lower developmental level.
	Birth Injury	98			
	Controls	191			
	Total	421	355		
Griffiths and Bryant (1971)	Neonatal Hypoglycaemia	75	41	Once. D. 1 year	No difference detected.
	Controls	75	41		
Honzik et al. (1965)	"Suspect" births	190	100	Once. D. 8 months	Trend for "suspect" cases to have lower developmental levels but not significant.
	Controls	190	100		

Author	Sample Type	Sample Size	Seen	No., Type & age at F.U. Examination	Conclusions
Keith et al. (1950)	Prolonged labour	216	179	Observed at Clinic over 1-4yr.	If survive asphyxia or prolonged labour, no difference detected in development.
	Normal labour	213	164		
	Asphyxia	97	86		
	No Asphyxia	109	88		
(1960)	Prolonged labour	402	321	Once. N. 1-14 years.	No difference detected between cases and controls
	Anoxia	236	180		
	Toxaemia	124	110		
	Controls	?	633		
Lubchenco et al. (1972)	Birth wt. 1500g or less	254	133	Once. Ps. 10 years.	I.Q. decreases and abnormalities increase as birth weight and length of gestation fall.
McDonald (1962 & 1964)	Birth wt. 4-lb or less	1100	1066	Once. Ps. 6-9 years	Prematurity only important perinatal factor. Social class effect significant.
Marstrander (1968)	Birth wt. 2000g. or less	181	136	x4. N. D. Birth - 18 mths.	No relationship between developmental levels and any perinatal factor other than low birth weight.

Author	Sample Type	Sample Size	Seen	No., Type & age at F.U. Examination	Conclusions
Niswander et al. (1966	Induced labour	175	131	Once. Ps. 4 years	No difference detected.
	Spontaneous onset	175	147		
Richards et al. (1968)	One minute Apgar score of: -			Once. D. 1 year	No difference detected.
	o - 4	41	26		
	9 -10	41	26		
Roberts (1971)	Antepartum haemorrhage or toxaemia.	231	193	Once. N. E.	Slightly slower development after antepartum haemorrhage or toxaemia but these conditions frequently occur with prematurity.
	Controls	231	193		
Rosenbaum et al. (1969)	Pregnancy proteinuria	?	53	Twice. D. Ps. 8 months and 4 years.	Slightly lower developmental levels after proteinuria.
	Controls	?	51		
Shipe et al. (1968)	Apgar score of 6 or less	33	24	Twice. Ps. 30 and 36m.	No difference detected.
	Controls	33	24		
Walsh et al. (1969)	Birth wt. 3-lb or less	133	100	Oncee. Ph. Ps. 5-9 years.	High incidence of emotional problems. Not associated with any other perinatal factors.
Ucko (1965)	Asphyxia	?	30	X8. Ph. Ps. Birth-5yr.	No difference in development or behaviour. Possible "temperamental" effect of asphyxia.
	Controls	?	51		

TYPE III STUDIES

The type of study best represented in the literature is the prospective study in which a group of children, known to have been exposed to a possible perinatal hazard, is observed for some time (Type III); a control group may be observed over the same period. Table III lists a selection of such studies. The terms used in this table are those used by the investigators. Some confusion may arise over the use of the term "prematurity". Until recently, a child of birth weight 5½ pounds (2500g) or less, or born after a gestation period of less than 37 weeks was considered a premature infant. The earlier studies in Table III have used this definition of prematurity. It is now accepted that the prognosis of a child with low birth weight, born after a gestation period of 40 weeks or more, is likely to be less favourable than that of a child of similar birth weight, born after a short gestation period which is compatible with its birth weight. In the more recent studies, investigators have described the children studied as being mature, but of low birth weight or "light for dates", or of short gestation. Infants born after a short gestation period may also be of lower birth weight than expected for that gestation period.

The results of the studies shown in Table III indicate that "prematurity", low birth weight and short gestation, both singly and in combination, have a definite effect on the subsequent growth and development of the child concerned; such children tend to be slower in their development and more likely to suffer from neurological defects. Both low birth weight and short gestation are frequently associated with complications of pregnancy and the perinatal period, particularly antepartum haemorrhage and toxaemia (Baird, 1959). It would appear that, once allowance has been made for short gestation and low birth weight it is not possible to demonstrate conclusively that these other perinatal factors have any direct effect on the subsequent progress of the children. (Creamer, 1955; Drillien, 1962; McDonald, 1964; Marstrander, 1968; Roberts, 1971; Walsh et al., 1969).

The work of Knoblock and Pasamanick suggested that the perinatal conditions considered by them to be associated with the continuum of reproductive casualty were those which were likely to produce anoxia in the foetus. Several workers have investigated the effects of anoxia or asphyxia immediately after birth. This ia described as a failure to establish normal respiration at birth; the child is limp and either pallid or cyanosed and resuscitation may be required. Most investigators base the diagnosis on the child's appearance but in some cases the oxygen content of the blood is measured. Two of the studies listed do suggest that neonatal anoxia may have a detrimental effect on subsequent development (Darke, 1944; Graham et al., 1962). Darke's work was on a very small sample, 49 severely asphyxiated infants, less than half of whom were seen on one occasion at ages ranging from 2 to 10 years. Although the two studies by Graham and her co-workers (1956 and 1962) indicated that there is an association between anoxia and poor developmental progress, another study from this centre (Graham et al., 1957), in which neurological testing was carried out on two groups of over 60 neonates, one group having had neonatal anoxia and the other normal controls, found that, in the absence of mechanical injury, no difference was detected between the two groups. Three other studies (Benaron et al., 1953; Keith et al., 1950 and 1960) suggest that if the child survives a prolonged or complicated labour or neonatal anoxia, there is no detectable effect on his subseqqent development.

Conway and Brackbill (1970) suggest that the use of anaesthesia in labour can affect early development but that recovery occurs by the age of 20 weeks; they found no relationship between the 4 week test results and any other social or obstetric factors, including Apgar scores. Unfortunately, their total sample which included non-anaesthetized controls, was small, 23 children only 15 of whom were seen at 20 weeks.

Toxaemia was associated with lower scores on psychological testing in the study of Buck and his co-workers (1969). All the children included in this survey were born after a gestation period of at least 38 weeks and were of at least 5½ pounds birth weight. The authors point out that relationship of toxaemia with low test scores was barely statistically significant and, only 60% of both study and control groups were actually traced. Roberts (1971) also found a relationship, which was just statistically significant between the incidence of antepartum haemorrhage and toxaemia and developmental levels at one year. However, he points out that there was a high incidence of prematurity associated with these conditions and he considered that their direct effect might be small.

An important point which emerges clearly from this group of studies is the effect of social class and other economic factors on development; a poor environment would seem to interact with a poor biological start in life (Drillien, 1962 and 1969; Eaves et al., 1970; McDonald, 1964). This possibility was discussed in the nineteenth century. In 1881, the newly formed American Social Science Association set up a "Register of Infant Development" and in a letter to its secretary, Mrs. Emily Talbot, Charles Darwin suggested that the education and background of the parents might have an effect on the development of the child (Quoted in "Studies in Child Development" Gesell, 1948). The influence of social and economic factors on child development was also pointed out by Knobloch and Pasamanick (1962). Three studies provide information of particular importance on this point, those of McDonald, Douglas and Drillien. All 3 studies are of a good epidemiological design and the follow-up rate is satisfactory.

McDonald's data concerned the surviving children of a birth weight of 4½ pound or less from the Medical Research Council Survey of Prematurity in March, 1959. (McDonald, 1962) 1100 children survived to the age of 6 years and information was obtained from schools and local authority medical staff on 1066 of these. From this information, it was found that there was a marked association between social class and the Intelligence Quotient, as measured on the Stanford-Binet scale. The correlation of low birth weight and low intelligence, although real, was overshadowed by this social class gradient; those children from the Register General's social class I and II had a higher mean score than those from Social class III who had a higher mean score than those from social classes IV and V.

Douglas's sample of premature babies was collected in a similar manner; it consisted, initially, of all the children of birth weight of 5½ pound or less who were included in the Maternity Survey of 1946. His full term controls were also children included in this survey and they were matched to the premature children for sex, place in family, mother's age, social group and degree of crowding in the home. In his first two papers on this work (1956a and 1956b), he concluded that the poorer performance of the premature children, up to the age of 6 years, could be explained simply by their prematurity. However, in 1960, a further investigation of school progress enabled him to reassess the factors involved. He found that, although cases and controls had been carefully matched at the beginning of the survey, the characteristics of the two groups had diverged over the years. In the premature group, significantly more fathers were unemployed and the standards of maternal care were significantly lower. On further investigation, he found that there were differences in the educational standards of the two groups and the employment history of the grandparents of the premature children was significantly worse than that of the controls. This finding is disturbing; it is obviously impractical to "match" for two or more generations. Douglas's work also stresses the important effect of environment on a child's development, physical, psychological and emotional (Douglas, 1969).

Drillien's work is of particular importance, in that, all the children involved were seen, in their own homes, by one observer at intervals of 6 months for two years and then annually until the age of 5. 595 children were included in the investigation and, at the 5 year visit, 96.4% were still in the study. (Drillien, 1962). Here again, prematurity was shown to be of great importance; the observed developmental quotient decreased with decreasing birth weight, the effect being particularly marked in children of a birth weight of 4½ lb. or less. The developmental status was also related to the social grading, and particularly to the mother's education; the smaller and less mature children tended to be more severely affected by adverse social factors.

GROWTH STUDIES.

The effect of environmental factors on development has been well illustrated in prospective studies, where a sample of children were selected at birth or shortly afterwards, information on the circumstances surrounding the pregnancy and birth are recorded and the childrens' progress observed. In contrast to the Type III studies, the children included in the study samples of these, Type IV, studies are not a group who have undergone some obstetric or neonatal hazard, but are usually representative of the population of all live births.
The Growth Study is a variation of Type IV studies; here, the sample is selected from children whose mothers are able and willing to co-operate over a long period, by attending a clinic regularly for an extensive series of tests which may take all day to administer. These studies are designed to chart normal growth and development and may involve anthropometric, roentgenological, biochemical, physical, neurological and psychological or developmental examination of each child (Tanner, 1947). There have been several Growth Studies of this type in the United States, for example, the Colorado Growth Study (Washburn, 1937), The Berkeley Growth Study (Jones and Bayley, 1941), the Harvard Growth Study (Stuart et al., 1939) and the Fels Research Institute Study (Sontag et al., 1958). Because of the method of sample selection, the children included in these studies have not been representative of the areas concerned but have tended to come from the upper end of the social scale. As the research interest of these studies has centred on the recording of normal development, much of the published material is irrelevant to the present discussion. However, some work from the Fels Research Institute (Moss and Kagan, 1958 and Kagan and Moss, 1959)

shows that, even in this relatively narrow spread of social class groupings, developmental progress is influenced by the educational level of the parents, particularly of the mother. A more recent study of this type is the International co-ordinated study of Child Development, in which centres in 8 countries took part. The Study was administered by the International Children's Centre in Paris and the general plan of the Study was the same in five of the centres, London, Paris, Zurich, Brussels and Stockholm. In Dakar and Kampala, only physical measurements of growth were made and in Louisville, the study took the form of a genetic study of twins (Falkner, 1960). The study in London began in 1951 and, following the general plan, a sample of 366 pregnant mothers was selected; 92 of these were later rejected by the investigators. The mothers had to be willing and able to co-operate by bringing their child to the clinic for examination at intervals of 3 months until the age of one year, at 18 and 24 months and annually after that. A further 50 mothers were unable or unwilling to do this and so the sample size was reduced to 224. Despite this selection procedure, wastage from non-attendance was high.

There is some evidence from this study (Hindley, 1965 and 1968 and Moore, 1968) and the corresponding study in Stockholm (Klackenberg-Larssen et al., 1968) that there is a strong association between social class and ability; this association appears to increase as the child grows older. Hindley (1968) suggests that social class may be a better predictor of a child's ultimate ability than is his performance on developmental scales before the age of 18 months.

Fifteen centres in the United States are involved in the

Collaborative Perinatal Research Project of the National Institute of Neurological Diseases and Stroke. In a recent survey of work already completed in the Project, Willerman (1972) states that the findings here also indicate that, although low birth weight and short gestation are associated with slower developmental progress in young children and lower intelligence quotients in older children, the social class influence is marked and, it appears that the adverse effects of low birth weight or short gestation can be at least partially compensated by a good socio-economic and educational background.

The Early Development Adversity Program is another American study which is underway at present. This study was described by Jordan and Spanner (1970) as "a prospective longitudinal enquiry into prenatal and preschool antecedents to status as a normal or handicapped child in the school years". At the time of their report, the Program had a data bank covering a complex of factors from gestation to the third birthday. Completed studies from this project indicate that, although adverse perinatal factors and poor socio-economic environment both influence later development, the influence is not sufficiently strong to make an index composed of all known relevant factors a reliable indication of either physical or mental development at one year of age.

TABLE IV - Type IV Studies - Representative groups of children selected during pregnancy or at birth and their progress observed.

Author	Sample Size	Sample Seen	No., Type & Age of F.U. Examination	Conclusions
Apgar (1955)	404	275	Once. Ps. 4 years	No relationship between neonatal blood oxygen levels and later development.
Schachter and Apgar (1966)	404	156	As above plus once more. N.Ps. 7 years	As above, but also found relationship between extent of perinatal complications and behaviour.
Butler and Engel (1969)	?	433	Twice. E.E.G., D. Neonatal & 8 months	Neonatal photic response, gestation and birth weight all corelated with developmental status.
Drage et al., (1966)	?	14115	Once. N. 1 year	More neurological defects in those with low Apgar than others in same birth weight groups.
Friedman et al., (1969)	1194	1020	x 3. N.Ps. Birth - 1 year	No difference detected between those born after normal and after dystocic or dysfunctional labour.

Key:
F.U. - Follow-up
D. - Developmental examination
N. - Neurological examination
Ps. - Psychological examination
Ph. - Physical examination
E.E.G. - Electroencephalogram

Author	Sample Size	Seen	No., Type & Age of F. U. Examination	Conclusions
Grantham - McGregor and Back, (1971)	300	Av. 235	x11. Ph. D. Birth - 1 year	Low birth weight babies slower in development.
Grantham - McGregor and Hawke (1971)		66	As above plus full Gesell Developmental Scales	First born children had higher score. Upper social classes higher score except on Gross Motor Scales.
Millar and Neligan (1969)	Approx. 9000	Over 7000	Various visits by health visitors. Birth - 11 years.	No causal relationship found between adverse perinatal factors and cerebral palsy or low I.Q.
Roberts, (1968 & 1970)	377	336	Twice. N. D. 4 - 52 weeks.	Birth difficulties associated with neurological defects at 4 weeks. Possible association between antepartum haemorrhage and toxaemia and lower developmental level at 1 year.
Stechler (1964)	26	26	x11. N. D. Ph. Birth - 3 years	9 apnoeic babies slower than other 17 to 2 years. No difference detected at 3 years.
Werner et al. (1967)	670	670	Once. Ph. Ps. 2 years.	Increasing degree of physical and developmental defect associated with increasing amount of "perinatal Stress" Accentuated by poor environment.
(1968)	670 +116	786	As above plus once more Ps. 9-11 years	Association with "perinatal stress" less marked than at 2 years. Environmental factors more important.

Author	Sample	Size Seen	No., Type & Age of F.U. Examination	Conclusions
Zachau-Christiansen (1967)	8430	6744	Twice. N.D. Birth - 1 year	Incidence of neurological defect and slow development increased in low birth weight, antepartum Haemorrhage and neonatal convulsions.
		Plus 1686	Postal F.U. at 1 year	

TYPE IV STUDIES

The prospective studies of Type IV, listed in Table IV, tend to show again that short gestation and low birth weight are the most significant single perinatal factors adversely influencing subsequent development. As in the studies of Type III, social class and environment emerge as important influences whose effect seems to increase as the child grows older. In three of the studies listed, other perinatal factors, in particular, antepartum haemorrhage and toxaemia were implicated (Roberts, 1970; Werner et al., 1967 and Zachau-Christiansen, 1967). In most cases, however, although statistically significant, this relationship may be of importance only when these factors are associated with prematurity; an association which is relatively common (Baird, 1959 and 1970; Roberts, 1969 and 1970). Werner et al. (1967) used a clinical perinatal rating, based on the presence of some 60 perinatal conditions thought to have a harmful effect on the foetus or newborn child; the grading, from 0 to 3, was based on a clinical assessment of the number and severity of conditions present. They found that, with increasing severity of perinatal stress, there was an increase in the proportion of 2 year olds and a less marked increase in the proportion of 10 year olds, considered to be below normal in physical, intellectual and social development. The quality of the home environment also had a significant effect on development; this effect seemed to be most marked in those children with the greatest amount of perinatal stress and increased as the children grew older.

The recent report on the National Child Development Study, 1958 cohort, (Davie, Butler and Goldstein, 1972) dealt mainly with the

Influence of the social and environmental factors on the growth and development of over 14,000 7 year old British children, from an original sample of 17,000. The effects of short gestation and low birth weight have also been analysed. The published findings confirm that the child of low birth weight and short gestation period, born to a mother of low Social class and short stature who smokes heavily during her pregnancy, has the greatest chance of becoming "educationally backward" and poorly adjusted socially by the age of 7 years. Analyses have yet to be completed for the remaining obstetric factors. When completed, these may indicate more clearly the role played by these factors, including antepartum haemorrhage and toxaemia, in the subsequent development of the child.

THE 'AT-RISK' CONCEPT

The published work already discussed indicates strongly that some maternal, perinatal and environmental conditions have a detrimental effect on the growth and development of children. Obvious defects present at birth or occurring in the neonatal period are comparatively simple to detect in the course of routine medical care. However, the defects which appear most likely to result from stressful perinatal factors may not appear until much later in life.

Early identification of the children who may be "at risk of handicapping conditions" is desirable and, with the uncovering of possible causal factors, this might be possible. Frequent examinations and adequate supervision of all children may be the ideal but is impractical. Thus, Lindon (1961) and Sheridan (1962) suggested that Risk Registers should be set up by the Local Authority Health Services; these registers would contain information on thos children considered to be most at risk of developing a handicapping condition, as a result of their poor family or perinatal history or present symptoms. It was thought that the existence of these registers would make it simpler to concentrate the various services on those children in whom it was expected that the majority of handicaps would occur.

Sheridan listed a wide range of risk factors. As the relative importance of individual factors is not yet fully understood, no weighting could be given to the factors in this list and, if rigidly adhered to, the use of such a list would result in the inclusion of 60 to 70% of all newborn babies in Local Authority Risk Registers

(Oppe, 1967). The inclusion of such a large number of children in these registers is self-defeating. Some authors (Oppe, 1967 and Walker, 1967) have suggested that essential or restricted criteria should be used, to ensure that only those most at risk, a theoretical 15 to 20%, would be included in the registers. But even when such a selected group only is included in a well organized register, with good follow up procedures, the results are disappointing in practice (Rogers, 1967 and Hamilton et al., 1968). Rogers found that, in Reading, approximately half of the handicaps occurred in children not on the Register; a similar finding was reported from Glasgow by Hamilton and her colleagues.

The theoretical concept of Risk Registers has been criticised by Richards and Roberts, (1967). They point out that the prevalence of handicap in the children included in the risk register must be considerably higher than in the population of children as a whole, before special supervision of the at-risk group can be adequate as a screening process. Even where statistically significant associations can be demonstrated between individual or combined obstetric complications and subsequent development, the increased incidence of handicaps may be too small to be of value in early detection procedures.

There are four basic criteria which any screening test should fulfill. It must be repeatable, sensitive, specific and at least relatively easy and practicable to administer and interpret. At first, the Risk Register would seem to be repeatable; but fashions change, in diagnosis, treatment and detection. The Register's sensitivity and specificity have been discussed. Such a register would be administratively practicable; the selection of cases can be made from routine records. But if 60 to 70% of all children are included in the register, it becomes a cumbersome and impractical clerical exercise.

The testing procedures most frequently used to screen children for developmental defects are scales or schedules developed from Gesell's developmental schedules. Such tests are deceptively simple to administer but their correct interpretation requires considerable skill and experience. The norms of development employed in these tests may not be reliable for the population under observation (Francis-Williams and Yule, 1967; Hindley, 1960) and some investigators have commented on the inconsistency of performance obtained on test items at the same age levels (Klackenberg-Larsson and Stensson, 1968).

More investigation is needed on both the range of normal development and the identification of those perinatal factors which, individually or in clusters affect development. Until such information is available, it would seem that present resources could best be deployed in a more intensive supervision of the 5 to 10% of children who are likely to yield 20 to 30% of all handicaps, combined with an effective, but less intense supervision of the remaining 90 to 95% of the population.

In the light of present knowledge, the group for intensive follow-up should include those of low birth weight (less than 4½lb.)

or short gestation period (of less than 37 weeks), those with severe perinatal hypoxia or birth injury, neonatal hyperbilirubinaemia, or with definite neurological symptoms (Rogers, 1968). Supervision of most of these children will probably be begun at hospital out patient clinics. Whether or not the supervision later takes place in the community, good liaison between hospital and community services and staff is essential. However, the main danger connected with any form of Risk Register would remain; the temptation is to concentrate entirely on this "special" group, forgetting that 70 to 80% of all handicaps will be present in the remainder of the population, particularly in that part of it which could be considered to be socially disadvantaged as opposed to the biological disadvantages of those on the Risk Register.

As standards of obstetric care have risen over the years, attempts to assess the effectiveness of obstetric services and practices have looked beyond the immediate mortality statistics to the quality of the survivors. It is difficult to identify a direct connection between the events of pregnancy and the perinatal period and definite defects of development. It is probable that individual hazards interact with each other and with environmental factors. Thus it is the effect of this interaction and not of any one event which will later manifest itself in the child. As yet, with the exception of some infections occurring during pregnancy, and low birth weight and short gestation, the part played by the incidents and complications of pregnancy and the perinatal period in the subsequent growth and development of the children who undergo them and survive, is obscure. If definite relationships could be detected, developmental studies might provide both an index of the effectiveness of the obstetric services and an indication of the manner in which they might be further improved.

If obstetric factors produce frank disease or disability, detection is relatively simple. If the defect produced is a deviation from or a delay in the normal developmental processes, detection is more difficult. Developmental testing procedures are in use, but little information is available on the span of normality or on the course of the development of most major abilities in babies. Determination of the normal variations in development is necessary before abnormal variations and their cause or causes can be identified.

DESCRIPTION OF THE INVESTIGATION

AIMS OF THE STUDY

When the opportunity arose to study some aspects of child development in Glasgow, it was decided that an attempt would be made to determine the level of development and normal variations in this level at intervals during the first year of life. The effects on these developmental levels of obstetric, environmental and social factors would also be examined.

The range of normal development can be investigated by cross-sectional or longitudinal studies. In cross-sectional studies, different groups of children are seen at various age levels; in longitudinal studies, the same children are followed during the course of their development. Cross-sectional studies have several practical advantages, particularly when only one observer is available. As different children are seen at each age level, results are more quickly available and more children can be seen at each age than in the longitudinal studies where results cannot be available until the group of children studied has had time to develop and where the number of children seen is limited by the necessity of performing further examinations on these same children at the correct age levels. A further disadvantage of longitudinal studies is the amount of wastage, from non-co-operation and removal, which may occur during the period of the study. And, if either child or examiner is unable to arrange an interview within a few days of the appointed date, the examination for that child at that age level must be excluded from the results. In a cross sectional study, however, unless a large number of children are seen at each age level, variations within the range of normal may give anomolous results; this problem does not arise in the longitudinal study where the same children are seen over a period of time and a more reliable assessment of the progress of development can be obtained.

In the published reports of longitudinal studies, wastage has frequently been high (Moore et al., 1954; Honzik et al., 1965). In many investigations the children must be brought to a clinic for each examination thus it is possible that those who remain in the study are not representative of the sample as a whole. It is likely that amongst those who continue to attend the clinic there will be a larger proportion of first children and children from families who possess private transport than in the sample as a whole; it is simpler to keep a clinic appointment if one can put the baby in a carry cot in the family car than if one has to struggle on and off public transport, with a fractious toddler as well as the baby who has to be taken to the clinic.

Drillien (1962) visited the children of her sample in their own homes. At the final visit, when the children were 5 years of age, she was still in contact with 96.4% of her sample which she had followed since birth. Some authorities claim that, for developmental testing to be valid, all procedures should be carried out under standard conditions in a suitably equipped clinic. As Drillien points out, this argument would be more convincing if the subjects for testing came from a standard environment. In practice, she found that up to the age of 4 years, children who had been tested both at home and in the clinic, tended to be more co-operative and responsive in their own homes.

In this study, a sample of Glasgow children were visited regularly, in their own homes throughout their first year of life. A physical examination and developmental assessment was performed at each visit. Obstetric information was obtained from the birth records and environmental and social data from the mothers of the children selected at the first home visit.

DESIGN OF THE INVESTIGATION

The basic plan of the investigation was that a sample of children should be selected from the birth registers of the City of Glasgow and each child visited at home, by appointment, at the ages of 4, 16, 28, 40 and 52 weeks. Only visits made within 5 days of the appropriate age levels were included in the results.

The forms used for recording the information were designed for the project and copies are included (Appendix. 1.) They were arranged so that most of the data collected could be coded as it was obtained and later transferred to I.B.M. 80 column punched cards and computer tape.

At each visit the child was physically examined and the developmental tests suitable for his age and maturational level performed; the child's health and any change in the social circumstances of the family since the previous visit were also noted. At the first visit, the mother of each child was questioned about the pregnancy and birth of the child and was asked to provide basic social and environmental information. Further information on the events of the pregnancy and birth were abstracted from birth and hospital records. After the final visit, when the child was 52 weeks old, an assessment of the mother and the family was made by the investigator, based on her observations during the period of the study.

Form 1, General Information, was used to record the obstetric and social history at the first interview and the investigator's assessment of the informant, the child and the home at every visit. It was also used to record the child's health and any changes in social or environmental conditions which had occurred since the previous visit.

As mothers vary markedly in their knowledge of the clinical events of pregnancy and birth, the information sought was at a simple level; duration of pregnancy, the presence of any illnesses or abnormalities during the pregnancy, if onset of labour was spontaneous or induced, the type of delivery and whether labour was considered normal or not. Enquiry was also made about the child's birth weight and condition during the neonatal period and the mother's previous obstetric history.

The environmental circumstances were noted; the size, condition and type of the house or flat, and the cooking and toilet facilities available. Information was also obtained on the number, ages and health of any sibs, and the education of both parents, the father's present employment, and the mother's employment before marriage. The social class of father and mother was then obtained by consulting the Registrar General's Classification of Occupations (1960).

To record the examination of the child, it was originally intended that examination schedules which had been standardised and for which norms were available, should be employed. Unfortunately, this was not possible. No neurological examination testing procedure for children beyond the first few weeks of life was found and when the developmental schedules in common use were examined, various limitations were detected. The sample groups of children on which the various scales were standardised were rarely representative of the populations from which the sample was drawn (Gesell, 1927; Bayley, 1933; Griffiths, 1954) and the American scales may not be reliable for use in Britain (Francis-Williams and Yule, 1967). There was little agreement between the tests, on the ages at which various skills were acquired and some scales showed internal inconsistencies. Some of the scales were compiled on cross sectional samples with only a small number of children seen at each age level (Griffiths, 1954; Frankenberg and Dodds, 1967); the description of the test items is not always precise and some items call for interpretation of the child's observed behaviour; the criteria used in the observation and recording of the items seems to differ from one schedule to another; and some scales give the age levels in calendar months and some in weeks. Therefore a procedure for the examination and recording of the neurological and developmental progress of the children seen in this investigation was compiled. Various formats were tried out in examinations of over 60 children, aged between 4 and 52 weeks, seen both in Infant Welfare Clinics and in their own homes. The design of Forms 2, 3 and 4 was decided upon for ease of completion under the conditions likely to be met on home visits.

Form 2, General Examination, was used to record the physical and neurological examination of the child at each visit and also includes part of the development of gross motor function, the examination of which followed naturally from the physical and neurological examination procedures.

The physical examination was brief and designed to detect any gross deviations from the normal which would interfere with developmental progress. It proved impossible to weigh the children as the amount of movement involved in transporting scales on home visits would have made any weights obtained unreliable. Head circumference and crown heel length was measured whenever possible.

The items included in the neurological examination were selected after study of the various testing procedures for the neonate and young infant (Andre-Thomas et al., 1960; Prechtl and Beintema, 1962; W.H.O., 1967) and the information available in the literature on the neurological examination of older children (Ingram, 1955; Paine, 1960; Paine and Oppe, 1966). The items of gross motor development recorded on this form were taken partly from the neurological texts mentioned above and partly from the Gross Motor Scales of the Developmental Schedules of Gesell (1947), Illingworth (1966) and Sheridan (1968).

Form 3 and Form 4 are both composed mainly of items selected from the Developmental Schedules of Gesell, Illingworth and Sheridan. The division into two parts was for convenience in recording.

Form 3 includes items on the development of social, visual, auditory and vocal skills, corresponding to the Personal-social and Language areas of development of Gesell, and the remainder of the items are concerned with Gross Motor Development. These items were placed on this form as they are either observed at any time throughout the examination, during the infants spontaneous play or, in several instances, cannot be elicited at will and information about their occurrence can only be obtained by questioning the mother.

The items on Form 4, Table Top Situations, correspond to the Adaptive and Fine Motor items included in Gesell's schedules and are grouped together here as they form a logical testing sequence, involving simple equipment.

The items selected for inclusion in the testing procedures had to be relatively simple to perform and to require no expensive and elaborate equipment. Some of the homes visited did not provide ideal testing conditions, being overcrowded and noisy. However, some form of testing procedure was always possible. The only examinations performed but excluded from the results as not being a reasonable test, were due to non-cooperation of the child and not to unsatisfactory conditions in the home.

Form 5 was completed after the final visit had taken place, normally when the child was 52 weeks of age. On this form some of the relevant social information was summarised. It also contained assessments, made by the investigator on the basis of the visits and observations during the preceding year. The points assessed were the attitude of parents and siblings to the survey child, a description of the family in terms of the stimulus provided for the developing child, regardless of economic factors, the time that the mother spent with the child and the child's activity and general attitude to the examiner and the test procedures. The physical and mental health of the mother during the period of the survey and if she was pregnant by the time of the survey child's first birthday was also recorded.

Form 6 was completed by consulting birth records and hospital notes and provided a summary of the events of pregnancy, delivery and the early neonatal period. Some of the records were incomplete so it was not possible to complete all the items in Form 6 for each child. The information entered on Form 6 included the age and height of the mother, her health during pregnancy, the length of the gestation period, and the circumstances of the labour and delivery. The information recorded about the child included the birth weight and condition at birth, resuscitation procedures where employed, the type of early neonatal care and the progress of the child until its discharge from hospital.

For every child in the survey, one copy each of Forms 5 and 6 were completed. There was also one fully completed Form 1, and for each visit after the initial one, there was a Form 1 in which the relevant portions were completed. Forms 2 and 3 were used at each visit and Form 4 was used at all except the first visit, when the child was 4 weeks old.

SURVEY PROCEDURE

Before any home visits were made in the study, the general practitioners, local authority medical officers and health visitors were told about the work and its purpose. The investigator attended the routine meetings of the health visitors and local authority medical officers to discuss the project with them and answer their questions. In this way the personnel who were most likely to be in touch with the mothers of the selected children were made aware of the work and enabled to reassure any mothers who approached them on the subject.

The study was divided into 2 parts. In the first part, a group of children were visited only twice at 40 and 52 weeks of age. This group was a representative sample of the children of relevant age in the City of Glasgow, which was selected by systematic sampling processes from the birth register for the appropriate period. No attempt was made to exclude any child for any reason.

As a result of the experience gained on this sample, it was decided to limit the population from which the sample to be used in the major part of the work should be drawn, (see page 69) to births occurring in 4 of the 10 maternity hospitals serving the City. The population of births was to be restricted further by the exclusion of all illegitimate children, all children of a birth weight of 4½lb. or less or born after a gestation period of less than 36 weeks, and those with a major congenital abnormality. As the first visit to the children was to take place when they were 4 weeks old, this information had to be obtained as soon as possible after birth and the health visitors were asked for their help. A letter (a 1 Appendix 2) was sent to each health visitor, telling her of the work already completed and asking for her co-operation.

Basic information on the births occurring in the maternity hospitals was available from the Maternal and Child Health Records of the Local Authority Health Services, within a week or so of the births; the births occurring from midnight on the Tuesday to midnight on the Wednesday of each week during which the sample was collected, were notified to the investigator. Letters were then sent to the health visitor into whose area each child would be discharged, asking her to complete and return a short form (b and c, Appendix 2). The information requested included the legitimacy of the child, its birth weight and gestation period and the presence of any major abnormalities or the occurence of any serious illness since the child was discharged from hospital. The level of co-operation was high and, with the information provided, the sample was selected. A letter of thanks was later sent to the health visitors (d, Appendix 2).

The first approach to the mothers of both samples was by a letter from the Director of the Social Paediatric Research Group, of which the investigator was a member. (e, Appendix 2). This letter gave the name and date of birth of the child and explained that only normal children were included in the sample; a suggested date and time were given for the investigator to call and the mother was asked to contact the unit if this was not convenient. At each visit to the children, a provisional appointment was made for the next visit 12 weeks later and this appointment was confirmed by a letter posted approximately a week before the date of the appointment (f, Appendix 2). When the letter confirming the appointment for the final visit went out, it was accompanied by a birthday card for the child's first birthday.

Most of the mothers appeared to enjoy the visits and made every effort to keep the appointments made; many of them expressed regret that the work was not going to continue until the child was older. At the completion of the study, a final letter was sent to the mothers, thanking them for their co-operation throughout the year (g, Appendix 2).

At the first visit, the name of the general practitioner with whom each child was registered was obtained from the mother. The practitioner was then informed that a child who was one of his patients was part of the study sample. (h, Appendix 2). This letter stressed that if any abnormality was detected in a child during the course of the investigation, the matter would be referred to the general practitioner and no direct action would be taken by the investigator.

CODING AND USE OF THE DATA RECORDED

In forms 2, 3 and 4, the items showing the developmental progress were recorded. In some cases, the progress is shown by the disappearance of an existing reflex or condition, for example the grasp reflex, or the appearance of a new reflex, for example the parachute reflex. In other cases, the developmental processes are shown by the gradual maturation of a skill or ability. In Form 2, the coding was arranged so that the code number represented the level of ability accomplished: for example, in the item on the development of the sitting posture -

Held in Sitting	0	No head control: back curved.
	1	Head erect momentarily.
	2	Head held steady, set forward: head wobble when swayed.
	3	Head held steady, erect: thoracic spine straight.
	4	Back straight: no head wobble when swayed.

Thus a child whose performance was coded as 4 on this item had reached a higher level of development than one whose performance was coded as 3.

On Forms 3 and 4 some of the items can be either present or absent only; but other items when present, can show varying degrees of maturity, for example, the child's ability to pick up a cube. On Forms 3 and 4, every item was coded but, where relevant, the items were ranged in order of maturity of response. The coding used was -

0 Has not yet reached this level

1 Was observed to achieve this item.

2 Not observed to achieve this item but mother reports that he is capable of accomplishing it.

\- Has accomplished this item and has moved on to a more mature level of development.

For example: in grasping a cube,

Holds cube in centre of palm with all fingers - Col. 11

Holds cube to radial side of palm - Col. 12

Picks up and holds cube with ends of fingers - Col. 13

	Child A	Child B	Child C
Col. 12	1	-	-
Col. 13	0	1	-
Col. 14	0	0	1

It can be seen from the list above that child C is the most mature of these three children in his grasp of a brick; he holds the brick in the tips of his fingers while child B holds it to the radial side of his palm and child A is still at the immature stage of holding the brick in the centre of his palm. By coding the results in this manner, it was later possible to work out a scoring system which would enable comparisons to be made within the group of children observed.

The items concerning Gross Motor Development on Form 2 and all items on Forms 3 and 4 were examined individually. Apart from a general progression of development, no obvious relationships between the groups of items were seen; an unsuccessful attempt was made to apply the principles of numerical taxonomy to the data obtained from the 'Table Top Situations' recorded on Form 4. It was clear that some items gave inconsistent results, for example, the item 'sits forward in pram, supported by reins' in the section on development of the sitting posture, Form 3, gave little true information on development as it was entirely dependent on the habits of the mother and her use of reins in the pram. In other items, there did not seem to be any clear progression in the performance of the child, for example, when a small bottle and a sugared pellet were placed in front of the child, on Form 4, there appeared to be nothing other than chance involved in the child's decision to approach the pellet or the bottle first. In other cases training obviously played a part. Some children were held up regularly to 'kiss' their image in a mirror 'Goodnight'. These children tended to 'kiss' their image in the mirror used in testing whereas those whose parents did not perform this ritual each night, did not do so.

The few such inconsistent items were removed and the score calculated for the remaining items. For the compilation of this score, the items on Gross Motor Development from Form 2 were converted into a form of coding similar to that of Forms 3 and 4, that is each level of maturity was coded separately. The score was designed to give due weighting to the difficulty of individual items, measured by the proportion of children who successfully achieved each of them.

The score for each item coded was calculated as follows:

Code 0, score = 0 plus the proportion of children with Code 0 on this item:

Code 1, score = midway between the scores for codes 0 and - on this item;

Code 2, score = three quarters of the score for code 1 on this item;

Code -, score = 2 minus the proportion of children with code - on this item.

Table V illustrates how this method of allotting scores is applied.

Table V - Examples of method of scoring.

Code	0	1	2	-
Example A				
Proportion of sample with code:	0.20	0.45	0.05	0.30
Score allotted:	0.20	0.95	0.72	1.70
Example B				
Proportion of sample with code:	0.60	0.10	0.25	0.05
Score allotted:	0.60	1.28	0.96	1.95

These examples demonstrate that the score obtained for code 0 is higher if few children have attained this item, as in B, than if only a few have not achieved it, as in A. The performance level for the group as a whole is reflected in the scores allotted for each item. It seemed that less weight should be given to items where the performance level was based on the history of the mother rather than the observation of the examiner; a factor of 0.75 was decided upon arbitrarily for this correction.

The items scored were placed in five groups, each covering one aspect of development; Physical development, Sitting and Walking development, Hand-Eye coordination, Vision and Fine Motor development, the "Table-Top" test items, and Social development. The scores for individual items were summed to give five scores, one for each of these groups of items. No attempt was made to calculate a total score as it was considered that such a score might obscure individual and group differences, when present. The scores were used as a means of ranking the children against each other. Although the ranking of an individual child can be compared at different age levels and in different areas of development, individual and group score.

were not compared. As the score and ranking obtained are a reflection of the developmental levels of any group studied, the scores of two or more different groups of children, even when scored at similar ages on the same items, may also not be comparable. The scores were developed as a research tool, and do not in any way resemble the Developmental Quotients used by some investigators.

The scores made it possible to obtain distribution curves for the level of performance at each age level studied, for each of the areas of developmental progress observed. The mean scores at each age level were also used to investigate the effects of various social and perinatal factors on development.

THE STUDY SAMPLES

THE PRELIMINARY STUDY

Ideally the sample studied in an attempt to assess normal developmental levels should include all children, or a random sample of all children, born in the population to be studied, over a period of 12 months or a selected week from each month or quarter of that year. Even then the results obtained may only be applicable for the population on which the work was done. Despite regional differences in developmental levels, it is likely that the course of development in different areas is broadly similar and results from studies performed in different areas would provide similar outlines of developmental progress.

As the time available for the present study was limited, it was not possible to assess an entire population of children. The restrictions imposed by one investigator visiting the same children regularly at intervals of 12 weeks, meant that the children to be seen had to be selected over a 12 week period and followed as a cohort.

The examination procedures and the forms used for recording the data were compiled for the project. They had been tried out in practise, for interviews and examinations in the homes of 20 children, aged from 4 to 52 weeks. The mothers of these children were regular clinic attenders and had been selected by health visitors as mothers who would like to co-operate in such an exercise. It was not known if these procedures would be practicable for the full scale project. It was difficult also to assess the time that should be allowed for each interview and how many children it would be possible to visit each week when the childrens' homes might be anywhere in Glasgow, an area of approximately seventy square miles.

In addition to these practical points, local authority personnel reported that there was a very high mobility rate among families with young children; frequently, they left their homes suddenly and no forwarding address was known. The local opinion was that contact could not be maintained with a reasonable proportion of any sample of young children for a period of a year.

It was, therefore, decided to see a smaller sample of children at 40 and 52 weeks of age, before embarking on the major part of the work. 120 children were selected, 12 to be seen each week, beginning in October, 1968. The preliminary figures available at the time of the selection showed that 5066 children, born in the first quarter of 1968 had survived the perinatal period, an average of 389 children per week. A 1 in 30 sample was selected by systematic sampling processes from the Birth Registers of the City of Glasgow for the relevant weeks during the first 3 months of 1968. The births for each week were considered to begin with the first birth after 12.00 a.m. on the Sunday morning. Every 30th birth was selected each week until 12 children had been chosen; if the child selected was known to have died in the perinatal period the next consecutive birth listed was taken. The selected lists were checked against the registered deaths to ensure that no child selected had died since the perinatal period.

Letters were sent to the mothers of the sample children 10 days before the date arranged for the interview (Appendix 2) 97 (80.8%) of the sample of 120 were seen at 40 weeks of age. 94 (78.3%) of the children were seen on a second occasion. Unfortunately an indisposition of the investigator made it impossible to see all of the children within 5 days of their first birthday; 73 (60.8%) of the children were seen at 52 weeks of age and the other 21 were seen at varying times from 53 to 56 weeks. Only those seen at 52 weeks were later included in the analysis. It was considered that a second visit to the rest of the children, within a few weeks of the date originally suggested would help to maintain the good relationships established and would also give some indication of wastage encountered between the 40 and 52 week visits.

Table VI - Preliminary Sample - Children examined at 40 and 52 weeks.

At Age	Number Seen	Not Seen	Total
40 wk.	97 (80.8%)	23 (19.2%)	120
52 wk.	73 (60.8%)	26 (21.7%)	120
53-56 wk.	21 (17.5%)		

Reason not seen at 40 weeks:

Refused	2
'Out' on several ocassions	7
Untraced	7
Moved away informed investigator	4
No English spoken	1
Child ill	2
Total	23

Table VI shows the visits completed on the first sample. Of the 23 children not seen, only 2 mothers refused to co-operate, in the study. 7 had moved away and were untraced and it was suspected that 4 of those who were 'out' on several ocassions had also moved away. 4 other families who had moved out of the area received the letter and wrote, to say that they had moved away. The mothers of the other 3 children not seen were contacted; in one case, a Pakistani child, no one in the house spoke English and in the other 2 cases, the children were ill. It is of interest that both of these children were of low birth weight.

The health visitors collect information on some obstetric and social factors from the mothers of all live born children in Glasgow for inclusion in the City's Record Linkage System (Richards and Nicholson, 1970). Therefore, data was available for those children not seen on: sex, legitimacy, birth weight, length of gestation, complications of pregnancy, place of delivery, mother's age, mother's obstetric history, number of rooms in the house, hot water supply and own W.C. These characteristics for the group not seen were compared with those of the group seen. No significant differences were detected between the two groups, apart from the sex distributions; in the group seen there were 40 boys and 57 girls and in those not seen, 17 boys and 6 girls. The greater proportion of boys in the "not seen" group was statistically significant. (X^2 = 6,674, p .01) No reason for this difference could be found.

To determine the statistical significance of the different distributions by sex, observed in these two groups of children, the X^2 test was used. Throughout this study, this test was used as a measure of the significance of any series of differences observed between two or more groups; where another test is employed, details are given in the text. As the samples are comparatively small, division into sub-groups could result in cells which were too small for adequate statistical testing to be performed. Where this occurred, subgroups were combined to give larger cells and a fourfold table, if possible. Yates correction was applied when the value of X^2 was calculated for a fourfold table involving small numbers in each cell. The level of significance was obtained in each case by consulting Tables of X^2 values (Fisher and Yates, 1957,) and the finding was accepted as statistically significant if the probability of the distribution observed occurring by chance was less than 0.05, that is if the X^2 value of a fourfold table exceeded 3.84)

No significant differences were detected when the children seen at 52 weeks of age were compared with those seen later.

19247 children were born in Glasgow in 1968 and survived the perinatal period. Information was available on their distribution by sex, place of delivery, method of delivery, mother's age and parity and Social Class of the father. The father's social class was not known for the children not seen but the social class distribution of the children seen did not differ significantly from that for all children surviving the perinatal period.

Table VII - Distribution of preliminary sample and Glasgow Births by Social Class of Father.

Social Class of Father	Children Surviving Perinatal Period, 1968	Sample Children Seen
I & II	1216 (6.3%)	8 (8.3%)
III	9546 (49.6%)	39 (40.2%)
IV	3426 (17.8%)	23 (23.7%)
V	2994 (15.6%)	19 (19.6%)
Other	2065 (10.7%)	8 (8.3%)
TOTAL	19247	97

The total sample did not differ significantly from the City as a whole for sex, place and method of delivery, mother's age and parity and number of rooms in the house.

CRITERIA FOR SELECTION OF MAIN STUDY SAMPLE

Only minor inconveniences occurred in the use of the examination and recording procedures on this first sample. No major alterations were required and they seemed suitable for use in the second part of the project.

Despite the fears of the local authority personnel, the number of children seen at 40 weeks on this first sample (80.8%), indicated that the loss from a sample seen regularly throughout the first year of life might not be of such a size that the work would be of no value. 14 (11.7%) were not contacted at all and 4 other families had left the area; thus 18, 15% of the sample of 120 were not available at 40 weeks of age. As mothers who had been visited since their baby was 4 weeks old might tell the investigator of their new address, wastage on the second sample might be kept within reasonable limits.

Other factors which emerged from the study of the first sample indicated that it would be advisable to limit the population from which the second sample was to be selected. The one illegitimate child could not be visited as the adoptive parents were outside the area; this is likely to happen and regular home visits to such a child might cause embarassment to the natural mother, if she keeps the child, or to the adoptive parents.

The two babies of low birth weight could not be seen at 40 weeks because of illness. There is considerable evidence to show that children of less than 4½ lb. birth weight have developmental defects (Drillien, 1962; McDonald, 1964) and, apart from the increased likelihood of visits being missed because of illness during the first year of life, it might be preferable to exclude them from a study attempting to assess normal developmental levels. One of these low birth weight children had a congenital defect, a cleft palate, and had spent much of the first year of his life in hospital; this is likely to be the case with any severe congenital abnormality or any condition requiring treatment. In addition, the presence of such an abnormality might prevent the normal progress of development and such children too should possibly be excluded from a study of normal development.

Two other children with congenital abnormalities were amongst those seen in the sample. One child had a congenital dislocation of the hip and was encased in a splint; she was, unable to perform the usual items in the examination of Gross Motor Development performed by most 40 week old children. The other child had cyanotic congenital heart disease; she too was slow in gross motor development and, since so many developmental skills in the young child are dependant on motor ability, she was comparatively slow in the other areas of development too. This effect has been demonstrated by several workers (Linde et al., 1967 and 1970; Rasof et al., 1967).

Therefore, it was decided to restrict the population from which the second sample was to be drawn by excluding illegitimate children, children of birth weight of 4½ lb. or less or of less than 36 weeks gestation, and all children known to have a major congenital abnormality, including hydrocephalus, spina bifida, amyotonia, phocomelia, exompholos, mongolism, congenital dislocation of the hip for which splinting was necessary, and congenital heart disease if diagnosed and requiring treatment before 4 weeks of age.

For the completion of Form 6, containing information on pregnancy and the perinatal period, the birth and hospital records were consulted. As it was hoped to relate this information to the subsequent developmental progress, some detail on the events of pregnancy and labour and the condition of the child at birth was essential. The information available from the midwives' records of home delivery was not sufficient for the purpose of this work.

When the hospital records were inspected, it was found that, 5 of the 10 hospitals recorded the condition of the child at birth simply as "limp" or "active". The other 5 hospitals recorded the condition of the child as an Apgar score. The Apgar rating (Apgar, 1953) is a practical method of evaluation of the condition of the new born infant; a rating of 10 points indicates a child in the best possible condition, 2 points each are allotted for respiratory effort, reflex irritability, muscle tone, heart rate and colour. This assessment is commonly made at 1 minute and 5 minutes after birth or at 2 minutes after birth. Although the scores allotted by different observers may not be strictly comparable, they provide the only available relatively objective assessment of the child's condition in the few minutes after birth. It was considered advisable that this information should be available for each child included in the study. In one of the 5 hospitals where Apgar scores were recorded, it was noted that they were omitted from almost half of the records consulted. About 40% of all Glasgow births take place in the 4 hospitals where Apgar counts are recorded routinely. It was decided that the population from which the second sample should be selected would be restricted to the births occurring in these four hospitals.

It was realised that such a restriction could produce a biased sample of children whose developmental progress was not representative of that of all Glasgow children. The scoring system, used elsewhere in the presentation of the statistics was not in use at that point in the survey. Therefore, the performance of the children on individual items of developmental performance recorded on Forms 2, 3 and 4 was scrutinized. Where a sufficiently large proportion of the children had performed an item to enable comparisons to be made, the children's performance was examined by place of birth. No significantly different trends in developmental progress were detected between the group of children born in the 4 hospitals selected and all other children examined, either together or divided into those born at home and those born in other hospitals or nursing homes. Only 2 single items were significantly different; the children born in the 4 hospitals selected made more effort to feed themselves with a spoon at 40 weeks ($p<.02$) and were more likely to try to scribble at 52 weeks of age than the rest of the children in the group ($p<.05$). However, as over 100 items were examined, it is probable that some statistically significant differences could occur by chance and, since no developmental trends were detected, it is unlikely that these 2 items were of any practical significance.

When the data on the obstetric factors was examined, in a similar manner, no significant differences were detected. However, when the social information available was examined, it was found that there was a tendency for the factors indicative of better social and envifonmental conditions to be more strongly associated with the children born in the 4 selected hospitals; this relationship was statistically significant for the distribution by the mother's social class before marriage. (Table VIII).

Table VIII - Social class distribution by place of birth.

Social Class of Father	Selected Hospitals	Other Place of Delivery	Total
I & II	3	5	8
III	16	23	39
IV, V and unemployed	13	37	50
TOTAL	32	65	97

($X^2 = 1.67$, not significant)

Social Class of Mother			
I & II	1	1	2
III	16	18	34
IV & V	15	46	61
TOTAL	32	65	97

($X^2 = 4.27$, $p < .05$)

Thus although there was no detectable difference in performance levels at 40 and 52 weeks of age between the children born in the selected hospitals and elsewhere, a sample drawn only from the births in these 4 hospitals would be likely to contain a larger proportion of children from the higher social classes, particularly of the mothers before marriage, than in the population of all Glasgow children surviving the perinatal period.

The individual items recorded on Forms 2, 3 and 4 were examined again by the social class distributions. The numbers in social classes I and II were too small for definite conclusions to be reached. But, when the performance of children whose mother's social class before marriage (SCM) had been I, II, or III was compared with those whose SCM was IV or V, there was a trend for the children from the SCM I, II and III group to perform better on the tests of Fine Motor Ability, the 'Table Top' tests, and to be slower in Gross Motor Development than those from the SCM IV and V group. There was no obvious trend in the Social Development.

This finding may indicate that there is a Social Class effect on development. As only about 8% of all Glasgow births occur in families where the father is in Social Class I or II, a representative sample of children from all Glasgow births would contain too few children from the higher social classes to enable valid comparisons to be made. Thus a sample from the population of births occurring in the 4 hospitals using Apgar counts to assess the child's condition at birth, although biased towards the higher social classes, might provide a more suitable sample for this study. The inclusion of a larger proportion of children from the higher social class backgrounds than in the City as a whole, might make it easier to detect the effect of other environmental variables such as maternal age, complications of pregnancy, and the position of the child in the family.

The population from which the main study sample was collected was therefore limited to children born in the 4 selected hospitals, after a gestation period of 36 weeks or more, weighing more than 4½ pounds at birth. Illegitimate children and those with major congenital abnormalities were also excluded before the sample was selected.

THE MAIN STUDY SAMPLE

The selection of the main study sample began in May, 1969; it extended over a period of 12 weeks, with a gap of one week during this time. This gap was arranged so that, over the year occupied in visits to the children, the gap in visiting would correspond with the New Year and Easter holiday weeks of 1970 when homevisiting would not be possible.

Notification of the births occurring in each of the 4 hospitals selected between midnight on the Tuesday and midnight on the Wednesday of each of the relevant weeks, was sent to the investigator. As the children were to be visited within 4 days of each of the chosen age levels, the choice of births occurring in the middle of each week made it easier to arrange visiting schedules.

With the assistance of the health visitors, (page 57) illegitimate children, children with a birth weight of $4\frac{1}{2}$ lbs or less or gestation period of less than 36 weeks; or with major congenital malformations or serious illness were identified and excluded. The maximum number of children that could be visited in any one week was 18, so if 18 or fewer children remained on the list for any one week after the exclusions were made, all of these children were visited; if more than 18 remained, the 18 children to be visited were selected by a random sampling procedure. In this way, 179 children, born between 28th May and 13th August, were selected.

The numbers of children actually seen at each visit are shown in Table IX. 11 children (6.7%) were not seen at all; 3 of these had moved away from the address to which they were discharged from hospital and their new address was too distant for visiting. 7 were 'out' on at least three ocassions when visits were attempted, some of these may have moved house. The mother of the remaining child was in hospital and the child was being cared for by relatives at some distance from Glasgow. There were no direct refusals to take part.

Table IX

Main Study Sample - Total Number of Children Seen at Each Visit.

At Age	Still In Survey No. seen	No. Missed	Total	No. Lost	Total
4 wks.	168 (93.3%)	-	168(93.3%)	11	179
16 wks.	147 (82.1%)	20 (11.2%)	167(92.7%)	1	168
28 wks.	154 (86.0%)	6 (3.1%)	160(89.3%)	7	167
40 wks.	153 (85.5%)	2 (1.1%)	155(86.6%)	5	160
52 wks.	144 (80.4%)	9 (5.0%)	153(85.5%)	2	155
TOTAL as at 52 wks	144 (80.4%)	9 (5.0%)	153(85.5%)	26(14.5%)	179(100%)

123 children (68.7%) were seen at all 5 ages and 151 (84.4%) were seen on 4 ocassions; of this latter group, 14 were not seen only at the 16 week visit when unavoidable circumstances made it impossible for the investigator to keep the appointments made. Thus a total of 137 mothers (77.1%) found it acceptable to be visited at home, on 5 occasions during their child's first year of life. Although only 144 children were seen at the 52 week visit, contact was maintained with 9 other mothers; 3 of these were in hospital at the relevant time, 2 having a further child, and the remainder were on holiday. 15 children were lost during the course of the study; 7 of these had

moved house and could not be traced, 4 were 'out' on several occasions and 4 had moved away from the area but kept in touch with the investigator by letter, until the child's first birthday. 24 of those still in the study at 52 weeks had moved house during the course of the investigation (13.4%) of the total sample, 15.7% of thos remaining at 52 weeks.

Some obstetrical and social information was obtained from the Glasgow Record Linkage System on the 11 children who were not seen at all. No differences were detected between the characteristics of this group, the group lost during the course of the study, of the groups not seen at the different ages and of the total sample for sex of the children, length of gestation period and birth weight, complications of pregnancy, place of delivery, onset and course of labour, type of delivery or the child's condition in the neonatal period. There was also no difference detected for the age, height and previous obstetric history of the mother, the size of house occupied or the possession of a hot water supply or the private use of a lavatory for the family. The social class distribution of the 11 children not seen was not known but there was no difference by social class of father or mother between the children lost from the study or not seen at one or more age level and the main group of children seen.

Full information of the distribution of Glasgow births for 1969 by obstetric and social factors is not yet available; the distribution figures available are for total births, live and still. As the total births for Glasgow in 1969 were 17,765 compared to 19,813 in 1968, and the factors influencing this reduction in birth rate are not known, it was considered preferable to compare the sample with the figures available for 1969 rather than the figures available on all children surviving the perinatal period in 1968. Table X compares the composition of the sample with the available information on all Glasgow births for 1969.

The sample contained a significantly lower proportion of children born after spontaneous vertex delivery. There were fewer mothers aged less than 20 and more first and second born children than might have been expected from the figures for the City as a whole, neither of these differences were statistically significant. As was expected from the way in which the sample was selected, the distribution of the sample by social class of the child's father was biased towards the higher social classes and the size of house occupied by the sample families also tended to be larger than for all city births; these differences were statistically significant.

Table X - Distribution of sample and Total Glasgow Births (1969) By Type of Delivery, Age and Parity of Mother, Size of House, and Social Class of Father

	Sample	All Glasgow Births, 1969
TOTAL	179	17765
DELIVERY		
Spontaneous vertex	125 (69.8%)	13714 (77.1%)
Other	54 (40.2%)	4051 (32.9%)
	($X^2 = 5.04$, $p < .05$)	
AGE OF MOTHER		
$<$ 20 yr.	12 (6.7%)	2025 (11.4%)

(Table X - Cont..)

	Sample	All Glasgow Births, 1969
AGE OF MOTHER		
20-24	64 (35.8%)	6004 (33.8%)
25-29	51 (28.5%)	4716 (26.5%)
30+	52 (29.0%)	4580 (25.8%)
K.N.	-	450 (2.5%)
	(X_2 = 0.93, not significant)	
PARITY OF MOTHER		
0	64 (35.8%)	5855 (32.9%)
1	52 (29.0%)	4397 (24.7%)
2	29 (16.2%)	2768 (15.6%)
3	12 (6.7%)	1747 (9.8%)
>3	21 (11.7%)	2392 (13.5%)
N.K.	-	606 (3.4%)
	(X^2 = 1.93, not significant)	
ROOMS IN HOME		
1	15 (8.4%)	1202 (6.8%)
2	52 (29.0%)	5832 (32.8%)
3	54 (30.2%)	5863 (33.0%)
4	38 (21.2%)	3043 (17.1%)
>4	20 (11.2%)	997 (5.6%)
N.K.	-	828 (4.7%)
	(X^2 = 7.82, $p < .02$)	
SOCIAL CLASS OF FATHER		
I & II	30 (17.9%)	1494 (8.4%)
III	74 (44.1%)	8987 (50.5%)
IV	25 (14.9%)	3445 (19.4%)

(Table X - Cont..)

	Sample	All Glasgow Births (1969)
SOCIAL CLASS OF FATHER		
V	29 (17.3%)	2525 (14.2%)
Other	10*(5.9%)	1314*(7.4%)
	(χ^2 = 20.24, p<.01)	

*These 2 groups are not strictly comparable as the sample group were all unemployed but the other group included not known and unclassified occupations.

It is probable that the differences between the sample and the population of all births in Glasgow was secondary to the Social Class differences; the higher social class families would tend to have larger homes and the mothers would tend to be older when their first child was born. Possibly too they would have smaller families which would result in a larger proportion of the sample being first born children and so being less likely to be born by spontaneous vertex delivery.

EXAMINER'S ASSESSMENT OF THE FAMILIES IN THE MAIN SAMPLE

At the end of the study, an assessment of the families of the children in the main sample was made. This was confined to the 144 families where the child was seen at the 52 week visit and with whom contact had been maintained for a year. The items graded included the attitude of the father and siblings, where relevant, to the survey child, the time that the mother spent with the child and the amount of stimulation which the child received in the home.

All such assessments are subjective and an interviewer may, unconsciously, give higher gradings to the families which are closest to his personal "ideal". They are, therefore, of limited value.

65 (45%) of the fathers of the 144 children were considered to have a "good" attitude to the child and to take great interest in his progress; only 2 fathers did not seem to be interested in their child. Of the 89 children who had brothers or sisters 43 (48%) were a source of pleasure and interest for their siblings but 11 (12%) were regarded with jealousy. 35 (24%) of families were considered to provide a stimulating environment for the child, 76 (53%) a good one and 33 (23%) only a fair or poor one.

Four types of contact between mother and child were assessed; the time spent by the mother on essential items such as feeding, on conscious "training" of the child, either in skills such as feeding himself or in early toilet training, contact in play and vocal contact. The time spent by the mother on the essential items or "training" of the child was considered excessive in a few cases, and this was not assessed as an optimal level of care. A maximum score of 10 was allotted; 59 (41%) of the mothers were given 10 points on this item and only 10 mothers (7%) scored 7 or less.

The attitude of the child to the examiner and the examination procedures was scored, with a maximum of 9 points for the most co-operative children; this item was probably the most subjective assessment attempted and the score given appeared to be affected by the child's performance levels on the test schedules. 52 children (36%) were considered to be highly co-operative with a score of 8 or 9; 11 children (8%) scored 4 or less.

There were large families of social class V where the atmosphere in the home was stimulating for the child and the whole family was sensibly attentive to his needs. But overall, the children from the higher social class families with one or two siblings were more likely to have interested and caring fathers and siblings and to live in a stimulating home and to have a mother who spent adequate, but not excessive, time in caring for their needs and playing with them.

The history of the mother's physical and mental health during the child's first year of life was also obtained at the 52 week visit. Two mothers had suffered depressive illnesses during the year; one of these had spent a period of 4 weeks in hospital when the child was around 3 months of age. One mother had cancer of the cervix and spent most of the second six months of the child's life in hospital. The father of one child died when the child was 6 months old and the mother and child left the district to return to relatives.

15 (10%) of the 153 mothers seen at the 40 week visit were pregnant at that time and in three cases, the new baby arrived before the survey child's first birthday. One mother had a therapeutic abortion eight months after the survey child's birth; her husband had deserted her shortly after this conception. Another couple separated when the survey child was 9 months old.

COMPARISON OF THE PRELIMINARY AND MAIN SAMPLES

Insufficient information was available on the social and obstetrical histories of the children not seen to enable comparisons to be made between the two complete samples; such comparisons were possible between the two groups which included all children seen in either sample on at least one occasion, 97 from the 120 of the preliminary sample and 168 from the 179 in the main sample.

As expected from the different procedures used in selecting the two samples, there was a greater proportion of children with parents in the higher social classes in the main sample; the difference in composition of the samples was significant for both the social class of the father and of the mother before marriage (Table XI) The level of parental education, particularly the mother's education was also significantly higher in the main sample.

Table XI - Distribution of both samples by Social Class of Parents.

Social Class	Preliminary Sample	Main Sample
FATHER		
I & II	8 (8.3%)	30 (17.9%)
IIIa	8 (8.3%)	17 (10.1%)
IIIb	31 (32.0%)	57 (33.9%)
IV & V	42 (55.7%)	54 (32.1%)
Unemployed	8 (8.3%)	10 (6.0%)
TOTAL	97	168
	($X^2 = 6.07$, $p < .05$)	

(Table XI - Cont..)

Social Class	Preliminary Sample	Main Sample
MOTHER		
I & II	2 (2.1%)	23 (13.7%)
IIIa	12 (12.4%)	30 (17.9%)
IIIb	22 (22.7%)	18 (10.7%)
IV & V	61 (62.9%)	97 (57.7%)
TOTAL	97	168

($X^2 = 8.65$, $p < .01$)

Environmental factors are linked with social class, and it was found that the families in the main sample were more likely to have a larger house, in better condition, a hot water supply and their own lavatory; the differences between the two samples were significant at the .05 level for possession of a lavatory and the condition of the home. Most homes were kept fairly clean, even when not tidy, and too few homes and children were considered to be dirty to enable any reliable conclusions to be drawn.

Despite a strong association in the main study sample between higher social class and increased age of mother at the time of delivery, ($p < .05$), there was no overall difference between the two samples by mother's age at delivery. Family size was also significantly related to social class, particularly of the mother and this was reflected in the composition of the two samples. The excess of families with 4 or more children in the preliminary sample was significant at the .05 level; no similar trend was shown in the distribution of families with more than 2 children under 5 years of age.

TABLE XII - Distribution of Samples by Family Size, Including Survey Child.

Family Size	Preliminary Sample	Main Sample
1	34 (35.1%)	63 (37.5%)
2	22 (22.7%)	48 (28.6%)
3	14 (14.4%)	29 (17.3%)
3	27 (27.8%)	28 (16.7%)
TOTAL	97	168
Children under 5 years		
1	50 (51.6%)	76 (45.2%)
2	32 (33.0%)	61 (36.3%)
2	15 (15.5%)	31 (18.4%)

There was an excess of girls in the first sample and an excess of boys in the main sample and the difference in distribution was significant at the .02 level. No explanation of this was found.

TABLE XIII - Distribution of Samples By Sex.

Sex	Preliminary Sample	Main Sample
Male	40 (41.2%)	98 (58.3%)
Female	57 (58.8%)	70 (41.7%)
TOTAL	97	168
	($X^2 = 6.53$, $p < .02$)	

Information obtained from the birth and hospital records for the two samples was also compared. There were relatively few babies in the first sample who had a birth weight of 4½ lb. or less or a gestation period of less than 36 weeks. So, despite the deliberate exclusion of children in these groups from the population from which the main sample was selected, no significant difference was found in the distribution of birth weights or length of gestation between the two samples. No significant differences were found between the two samples for the other factors studied, namely the incidence of toxaemia, onset of labour, type of delivery, and complications arising in the child or in the mother during the perinatal period.

Although the main sample was selected from a restricted population and was not representative of the Glasgow children, from birth to one year of age, it differed from the representative preliminary sample only in the sex ratio and in the distribution by social class of father and mother and of the items associated with social class, including family size.

THE OBSTETRIC HISTORY OF
THE CHILDREN STUDIED.

DIFFERENCES BETWEEN THE MOTHER'S HISTORY AND THE HOSPITAL RECORDS

At the first visit to each child in the survey, basic information was obtained from the mother on her health in pregnancy, the conduct of the labour and delivery and the condition of the child during the early neonatal period (Form 1). Similar information was obtained from birth and hospital records (Form 6), and the data obtained from both sources compared. For the purposes of this comparison, the information was examined on five points, namely length of gestation, the mother's health during pregnancy, the progress of the labour and delivery, the birth weight of the child and its condition at birth and during the early neonatal period. For length of gestation and birth weight absolute accuracy was not expected; if the disparity did not exceed 2 weeks for the length of gestation or 4 ounces for the birth weight, the information from the two sources was considered to agree. 4 records could not be traced, those of two of the mothers in each sample.

The histories obtained from 32 (33.0%) of the mothers of the preliminary sample and 77 (45.8%) of the mothers in the main sample agreed with the information obtained from the records; most mothers who disagreed with the records did so on one point only but 24 mothers in each sample disagreed with the records on two or three points (Table XIV). If the information obtained from birth and hospital records can be considered accurate, it seems that when interviewed only 4 weeks after delivery, more than half the mothers cannot provide correct information on the events of pregnancy and the perinatal period. The proportion of mothers who can provide accurate information is significantly less when they are not interviewed until 40 weeks after delivery and the extent to which they disagree with official records is also significantly higher.

TABLE XIV - Extent of Disagreement Between Mother's History and Hospital Records.

	Preliminary Sample	Main Sample
Sample size	97	168
Records Traced	95 (97.9%)	166 (98.8%)
Total Agreeing	32 (33.0%)	77 (45.8%)
Disagreeing on 1 point	39 (40.2%)	65 (38.7%)
2 points	19 (19.6%)	17 (10.1%)
3 points	5 (5.2%)	7 (4.2%)
Total Disagreeing	63 (65.0%)	89 (53.0%)

For any disagreements, $X^2 = 4.121$, $p < .05$

For 2 or 3 disagreements, $X^2 = 3.856$, $p < .05$

TABLE XV - Distribution of Disagreements By Points Examined.

	Preliminary Sample	Main Sample
Gestation	9 (9.3%)	11 (6.5%)
Pregnancy	24 (24.7%)	41 (24.4%)
Labour & Delivery	16 (16.5%)	30 (17.9%)
Birth Weight	16 (16.5%)	10 (6.0%)
Neonatal Condition	27 (27.8%)	28 (16.7%)

Table XV shows the distribution of the disagreements over the areas studied. There is little difference between the apparent accuracy of the memories of the mothers visited 4 and 40 weeks after delivery for the length of the gestation period and the history of pregnancy, labour and delivery. However, a significantly higher number of those seen at 40 weeks disagreed with the records on the birth weight of their child ($X^2 = 6.724$, $p < .02$) and on the childs condition in the neonatal period ($X^2 = 4.179$, $p < .05$).

In the reporting of length of gestation and birth weight, the mother's information did not err consistently in either direction. But there was a definite tendency to forget, or not report, abnormalities and complications of pregnancy, labour and delivery and of the child in the neonatal period. The time which had elapsed between delivery and the history being obtained from the mothers of the children was only one factor which might account for the difference in accuracy of the histories given by the mothers in the two sample groups. The antenatal care and the place of delivery was different for the two groups and the main sample contained a larger proportion of mothers from the higher social classes, fewer children born by spontaneous vertex delivery and fewer large families than the preliminary sample.

No relationship was detected between the number or type of disagreements and the type of ante natal care, place of delivery or type of delivery. In the main sample significantly more mothers whose first child was the survey child disagreed with the records ($X^2 = 4.115$, $p < .05$). This did not appear to be the case in the preliminary sample. There was a slight trend in both samples for the mothers from the lower social classes to disagree with the records more frequently but this was not significant in either sample.

TABLE XVI - Disagreements by family size & social class of mother

	Preliminary Sample		Main Sample	
	Agree	Disagree	Agree	Disagree
Primiparous Mothers	14	20	23	40
Multiparous Mothers	18	43	54	49
TOTAL	32	69	77	89
Social Class of Mother				
I & II	2	-	16	7
III	15	19	17	31
IV & V	15	44	44	51
TOTAL	32	69	77	89

In both samples there was a significant relationship between mother's social class, but not father's social class and size of family. The children whose mothers had professional or secretarial qualifications were more likely to be first children; in both samples this was significant at the .01 level.

It is feasible that, although mothers of higher social class are, in general, more likely to understand and recall accurately the events of pregnancy and delivery than the mothers of the lower social classes, in these samples the high incidence of first babies in the mothers of higher social class has counteracted this. Thus it is possible that the difference noted in the proportions of mothers disagreeing with the records for the two samples, is a function of the time which elapsed between the delivery and the interview rather than a reflection of the composition of the group by social class and family size.

Although hospital records may not always be complete, they are likely to record the occurrence of abnormalities and complications of pregnancy and delivery. In the two groups examined, a total of 261, most of the disparity between the history obtained from the mothers and the information given in the notes, seemed to be caused by under-reporting of complications by the mother. The type of disagreement, under- or over-reporting was not shown to be associated with social class, family size or time between delivery and interview.

Health in pregnancy as reported by the mother did not tally with the records in 65 cases; in 42 cases, the mother had not mentioned a complication recorded in her notes. 33 of the 46 mothers whose history of the course of pregnancy and delivery did not agree with that given in the notes, seemed to have omitted to mention the occurrence of some complication. 30 mothers said that their children had been well and active at birth and the notes for these children stated that they had been 'limp' or had had an Apgar count of 7 or less and had been in need of active resuscitation procedures. 16 mothers failed to mention some other neonatal illness or complication mentioned in the notes. Only 6 of the 53 mothers who disagreed with the records on the condition of their child in the early neonatal period reported the existence of some condition not mentioned in the notes.

It is not surprising that mothers, particularly if primiparous, are confused and uncertain of the events occurring during their labour and delivery. Also, the condition of their child at birth, or in the first few days of life may be kept from them deliberately. However, the lack of adequate knowledge of the history of the events of their pregnancy and perinatal period shown by these two groups of mothers, seen at 4 and 40 weeks after their delivery, makes any perinatal history obtained later in the childs life of doubtful value.

As a result of the disparity shown between the history as obtained from the mother and that recorded in the birth and hospital records, it was decided that the data on the hazards of pregnancy and the perinatal period used in this study, would be based on the information obtained from birth and hospital records. All subsequent comments and calculations on this aspect of the study will be based only on such data.

OBSTETRIC HISTORY OF THE CHILDREN STUDIED

With the exception of prematurity and some infective processes, no single hazard of pregnancy or the perinatal period has been convincingly identified as directly responsible for a physical or psychological defect arising in a child exposed to it. Statistically significant relationships have been identified in some cases. But as it is difficult to isolate any one condition, it is almost impossible to ensure that the apparent effects of one factor are not really the effects of a multitude of closely related social and obstetric factors.

The information obtained from the birth and hospital records of the children included in this study, were examined to assess the relationship of obstetric hazards to each other and to some social factors. Immature infants and those of birth weight 4½ lbs or less had been excluded from the main sample; only two children with a birth weight of 4½ lb. or less were included in the preliminary sample. Thus the effect of prematurity could not be studied.

Ideally, a pregnancy without illness or complications, lasting a minimum of 36 and a maximum of 42 weeks, should end in the spontaneous onset of labour. Labour should then proceed, without abnormalities or a prolonged second stage, to the spontaneous delivery of an active child whose birth weight corresponds with the length of the gestation period and who suffers no biochemical, respiratory or haematological disorder during the first 10 days of his life. In the two groups of children studied, only 86 (33%) conformed to this ideal.

The deviations from the ideal, 'normal' pregnancy included pre-eclamptic toxaemia, anaemia, hyperemesis, vaginal bleeding and intercurrent infections. Abnormalities of labour and delivery included induction of labour, complications of mother or child arising during labour, a second stage of labour lasting more than two hours, delivery other than a spontaneous vertex delivery and the birth of a child described as "limp" or had an Apgar score of 6 or less at birth and needed active resuscitation or required special care in the first 48 hours of life.

Complications were considered to be present in the neonatal period if the child had been subjected to birth injury, with or without abnormal neurological signs, or had jaundice, respiratory complications, bichemical or haematological disorders, hypothermia or infections, other than superficial, during the first ten days of life.

Some children had a history which deviated in only one or two minor ways from the ideal, but most of the minor disorders listed have been suspected of having a harmful effect on the subsequent growth and development of children exposed to them. Even such minor complications tend to occur in combination (Table XVII) and it is possible that if a child is subjected to several such minor mishaps, their combined effect might be as significant as that of an adequately treated major mishap.

TABLE XVII - Events occuring during the obstetric history of the Children Studied.

	Preliminary sample	Main sample
Normal obstetric history	34 (35.8%)	52 (31.3%)
Total Deviating from Normal	61 (64.2%)	114 (68.7%)

(Table XVII - Cont..)

	Preliminary Sample	Main Sample
Deviating only in:		
Pregnancy	6 (6.3%)	15 (9.0%)
Labour & Delivery	7 (7.4%)	33 (19.9%)
Neonatal Period	9 (9.5%)	12 (7.2%)
Deviating in:		
Pregnancy and labour & delivery	11 (11.6%)	20 (12.6%)
Pregnancy and neonatal period	3 (3.2%)	3 (1.8%)
Labour & delivery and neonatal period	14 (14.7%)	20 (12.0%)
Deviating in pregnancy, labour and delivery, and neonatal period.	11 (11.6%)	11 (6.6%)

There was no significant different in the proportions of each of the samples in the groups listed. It was considered that the two groups could be taken together for further examination of the relationships between obstetric and social factors.

TABLE XVIII - Occurence of Multiple Complications.

Complications of Pregnancy		
None	186	71.3%
Any	75	28.7%
Complications of Labour and Delivery		
None	101	38.7%
1	53	20.3%
2 or 3	71	27.2%
4 or more	36	13.8%

(Table XVIII - Cont..)

Complications of neonatal period		
None	220	84.3%
Any	41	15.7%
Total Cases Studied		
	261	100%

The figures shown in Table XVIII indicate that complications of labour and delivery are often multiple; some complications are frequently associated, for example, a prolonged second stage of labour may result in foetal distress which may be sufficiently severe to necessitate immediate operative delivery with the birth of an asphyxiated child. In only 18 (6.9%) of cases was there more than one complication of pregnancy and there were only 9 (3.4%) children who had more than one complication of the neonatal period.

Table XIX shows the distribution of the cases with 2 or more complications of pregnancy and delivery or any complications of pregnancy and the neonatal period by maternal age and parity and by social class of both father and mother before marriage.

In this study where the extremes have been arbitrarily excluded, there is a tendency for there to be fewer complications of labour and delivery and neonatal complications of the child with rising maternal age; there is no apparent relationship between maternal age and complications of pregnancy. Maternal age and parity are related so that the seemingly beneficial effect of age may be a secondary to increased parity. Table XIX does indicate that primiparous women tend to have a higher number of complications of labour and delivery; this relationship is significant at the 0.01 level. Despite there being no obvious relationship between maternal age and pregnancy complications, these too appear to be most likely to occur in primiparous women; parity does not appear to be associated with neonatal complications.

TABLE XIX - Distribution, by percentage values of multiple obstetric complications by maternal age, parity and social class and father's social class.

	2 or more complications of labour & delivery	Any complications of pregnancy	Any complications of neonatal period
TOTAL	41.0	28.7	15.7
Maternal Age.			
25 yr.	45.9	23.4	12.6
25-29	39.8	34.2	16.4
30+	34.6	30.8	19.2
Parity.			
1	74.0	38.5	15.6
2	22.9	21.4	15.7
3 or more	21.2	24.2	15.2
Maternal Social Class.			
I & II	64.0	40.0	16.0
III	48.8	31.7	13.4
IV & V	34.2	25.3	16.5
Paternal Social Class.			
I & II	36.9	26.3	10.5
III	46.0	28.3	14.2
IV & V and unemployed.	35.8	29.8	18.4

When examined by social class of father, there is no obvious trend for the distribution of pregnancy complications, complications of labour and delivery are commonest in Social class III and the possibility of complications arising in the neonatal period increases as the social class scale is descended. None of these trends are statistically significant.

If the distribution of complications by social class of mother is examined, however, a clear picture emerges of a very high incidence of multiple complications of labour and delivery and of any complications of pregnancy at the upper end of the social class grading. There is no consistent relationship for neonatal complications. Although there are only 25 mothers in social class I and II, the relationship is sufficiently strong to be statistically significant at the .01 level for complications of labour and delivery and at the .05 level for complications of pregnancy. It appears from the figures shown in these tables that primiparous women who have had professional training before marriage, are least likely to have a completely normal pregnancy and delivery. It is possible that this is due to social rather than obstetric causes; all other factors being equal, women from the upper social class groups seem more likely to be induced at, or shortly after, 40 weeks of pregnancy and to have assisted deliveries than women from social class V.

THE DISTRIBUTION AND INTER-RELATIONSHIP OF SOME COMPLICATIONS OF PREGNANCY AND THE PERINATAL PERIOD.

Six groups of complications were studied in greater detail: pre-eclamptic toxaemia, hyperemesis gravidarum, anaemia and bleeding during pregnancy, delivery other than spontaneous vertex delivery and a heterogeeous group of peri- and neo-natal hazards. The data was obtained from birth and hospital records so hyperemesis, bleeding during pregnancy and toxaemia or eclampsia were considered to have occurred only when they had been recorded as such in these records. It is possible, therefore, that some conditions, for example hyperemesis have not been recorded in every case. The diagnosis of anaemia was made if the haemoglobin level had dropped below 10.4g per 100 ml. In 15 cases in which all social levels were represented (5.7%) there was no recorded haemoglobin levels at all and in other instances only one estimation had been made in early pregnancy; the incidence of anaemia of pregnancy may therefore by greater than it appears to be from these results. The records of the labour were generally complete; the types of delivery included in the operative delivery group included abnormal presentation, spontaneous or assisted breech delivery, ventouse or forceps extraction and caesarian section. The children included in the neonatal complications group were: those who had had an Apgar score of 6 or less at birth or were described as 'limp' and required active resuscitation, the children who needed special care for the first 48 hours of life, and those who received a birth injury or exhibited abnormal neurological signs, or who suffered biochemical, haematological or respiratory disorders, or hypothermia during their first week of life.

Apgar scores were available for all the children in the main sample but for only 43 (44%) of the preliminary sample. The other 52 infants in the preliminary sample were described only as "limp" or "active" at birth. Clearance of the upper air passages by suction and the administration of oxygen by face mask was the usual procedure in all births. More active resuscitation measures were undertaken where the child was "limp" or had an Apgar score of 6 or less. The first step taken was normally the clearance of the airways under direct vision, followed by the administration of oxygen via a mask and airway. If the child was severely affected or these measures failed, an endotracheal tube was inserted, the airways again cleared by suction and oxygen administered via the endotracheal tube with intermittent positive pressure. In a few cases, the child was placed in a hyperbaric chamber and oxygen supplied in this way. Sodium bicarbonate and intramuscular stimulants were given as required in individual cases.

The incidence of the 6 complications studied was not significantly different in the two samples so for this section of the work, the two samples were considered as one group.

TABLE XX - Incidence of 6 complications in 261 single pregnancies.

Complications	No. not associated with other 5 complic.	No. associated with any other of the 5 complic.	Total No. Complic.	% of whole sample
Bleeding	4	16	20	7.7
Toxaemia	9	25	34	13.0
Hyperemesis	3	6	9	3.4
Anaemia	18	12	30	11.5
Operative Dly.	26	45	71	27.2
Neonatal Conditions	28	46	74	28.4

The incidence of the six complications studied is show in Table XX. At least a third of those having any one of these, had one or more additional one; with some conditions, the possibility of their being associated with another is even greater, for example only 4 of the 20 women who had bleeding in pregnancy had none of the other 5 complications studied. This inter-relationship is demonstrated in Table XXI, where the complications are arranged in arbitrary order of priority.

TABLE XXI - Inter-relations between the 6 complications studied in 261 pregnancies.

Principal Complication.	Associated complications Bleeding	Toxaemia	Hyper-emisis	Anaemia	Operative Delivery	Neonatal Conditions
Bleeding	20	4	2	1	8	11
Toxaemia		34	2	4	20	13
Hyperemesis			9	-	4	4
Anaemia				30	4	8
Operative Delivery					71	30
Neonatal Conditions						74

TABLE XXII - Distribution, by percentage value of 6 complications of pregnancy and delivery by maternal age, parity, and by social class of father and of mother.

	Bleeding	Toxaemia	Hyper-emesis	Anaemia	Operative Delivery	Neonatal Conditions
Total	7.7	13.0	3.4	11.5	27.2	28.4

(Table XXII - Cont..)

	Bleeding	Toxaemia	Hyper-emesis	Anaemia	Operative Delivery	Neonatal Conditions
Maternal Age.						
25	3.6	13.5	3.6	13.5	27.9	26.1
25-29	9.6	12.3	2.7	6.8	21.9	31.5
30+	11.5	12.8	2.6	12.8	29.5	28.2
Parity						
1	9.3	23.7	7.2	8.2	48.5	42.3
2	7.2	4.3	1.5	8.6	14.3	21.4
3 or more	6.1	8.2	-	16.3	14.3	18.4
Mother's Social Class						
I & II	12.0	28.0	12.0	4.0	32.0	32.0
III	9.8	17.1	4.9	9.8	30.5	31.7
IV & V	5.7	8.2	0.6	13.3	24.1	25.3
Father's Social Class						
I & II	7.9	13.2	7.9	5.3	28.9	18.4
III	5.3	15.0	2.7	12.4	22.1	31.8
IV? V and Unemployed	9.6	10.5	1.8	12.3	23.7	27.2

Table XXII shows the distribution of the six complications by maternal age and parity and by the social class of father and mother before marriage. Maternal age does not appear to have any consistent effect on the incidence of any of the complications except bleeding in pregnancy. The numbers involved are too small for reliable statistical testing but there is a tendency for bleeding in pregnancy to be more common in older mothers.

Parity seems to have a definite effect on the distribution of all six complications studied. Anaemia occurs more frequently during third and subsequent pregnancies and the other five complications are most likely to occur during a first pregnancy; this relationship is significant at the 0.01 level for toxaemia, operative delivery and neonatal complications.

When examined by social class of father, there is a tendency for the incidence of anaemia and neonatal complications to be higher in the lower social class groups and for operative delivery and hyperemesis to occur more frequently in the upper social classes. Bleeding in pregnancy and toxaemia show no definite trends. As has already been shown for the occurrence of multiple complications of labour and delivery, the social class of the mother has a marked effect on the incidence of these complications. There is a marked social class gradient, with the higher incidence in the upper social classes for bleeding in pregnancy, toxaemia, hyperemesis, operative delivery and neonatal complications; a gradient also exists for the incidence of anaemia but here it is in the opposite direction with the highest incidence in the lower social classes. As there were only 25 mothers from social classes I and II, the numbers involved are too small for adequate statistical testing. However, the presence of a gradient in each case suggests that there may be a true relationship between the social class of a mother before her marriage and the likelihood of complications occurring during her pregnancy.

In the 261 families studied, 9 of the 25 mothers classed as social class I or II on their occupation before marriage, had married men of social class III and of the 38 men of social class I or II, 22 had married women from lower social classes. Family size tended to be related to social class of father but this relationship was much less obvious than that between family size and social class of mother; mothers with professional or secretarial training were much more likely to have only one or two children at the time of the study ($p < .01$). In many investigations only the distribution of complications by the father's social class is studied. As the social class of the mother would seem to have a greater effect on family size and as mothers social class after marriage may differ from that before marriage, any real effect of the mother's social class may be obscured. The mother's social class before marriage reflects her own environment as a child, her education or training and her capabilities; it is likely to be an important factor in her later experience in child-bearing and child rearing.

The social factors and the complications studied are inter-related in a complicated way. Thus it is difficult to pick out any individual factors which are connected causally. It does seem that the first born children of mothers who were graded as social class I or II before their marriage are much more likely to have been subjected to complications of pregnancy, multiple complications of labour and delivery and in such pregnancies the incidence of bleeding, toxaemia, hyperemesis, operative delivery and complications of the child during the neonatal period are likely to occur more often. Anaemia is the exception among the complications studied; it seems most likely to occur during the third and subsequent pregnancies of women from the lower social classes.

As the main sample in this study was selected in a manner which produced a biased social class distribution, it is not possible to compare the incidence of obstetric complications directly with those of other studies. However the incidence of bleeding in pregnancy (7.7%) and toxaemia are similar to thos of 10.7% and 14.3% found by Roberts (1969) in a group of 352 Welsh mothers, which had a similarly biased social class distribution. 12.4% of his sample were reported to have had hyperemesis; the source of information differed as his data was from the mother's history of her pregnancy. Hyperemesis is the complaint which is most likely to be self-diagnosed and so may be reported by mothers more often than it is entered in ante natal clinic notes. Roberts also found an inter-relationship of obstetric complications similar to that found in this study.

The incidence of complications and their relationship with social factors are, with the exception of toxaemia, in line with those found in the British Perinatal Mortality Survey (Butler and Alberman, 1969). In the Perinatal Mortality Survey, the incidence of toxaemia was considered to be 27.5%, as compared with 13.0% in this study. It is probable that the diagnostic criteria used differed; in the Perinatal Mortality Survey, a diastolic blood pressure of 90 to 99 mm of mercury, without proteinuria, was diagnosed as mild pre eclampsia. In the Glasgow hospitals in which the majority of the children in the samples were born, there was a tendency not to make a diagnosis of pre eclampsia until the diastolic pressure exceeded this level unless proteinuria was also present. Thusthe toxaemic group in this study may correspond to the moderate and severe groups in the Perinatal Mortality Survey, with an incidence of 10.1%. Even so, there was no obvious relationship found in this study to correspond with their findings of an association between the incidence of toxaemia and maternal age and social class of father.

Complications and hazards of pregnancy and the perinatal period are of common occurrence; only a third (86) of the 261 children studied had a history of a completely "normal" pregnancy and perinatal period. Statistical significance testing can only indicate that a relationship is unlikely to have occurred by chance; at the .05 level of significance, a relationship could still exist by chance in 5 cases out of every hundred examined. Thus a relationship between any complication and subsequent defects in the child, even if statistically significant, is not necessarily causally related. If the conditions examined commonly occur, a connection between them may be coincidental.

THE DEVELOPMENTAL EXAMINATIONS

MUSCLE TONE, POSTURE AND REFLEX ACTIVITY OF THE STUDY CHILDREN

In the neonatal period, much of an infants response to stimuli is automatic and as such automatisms are controlled mainly at cord level, they are largely independent of cerebral functioning. As the central nervous system matures, this reflex activity is modified, first by the developing centres in the brain stem, later by the affect of the basal ganglia and, eventually by the influence of the cerebral cortex. The inhibition and disappearance of primitive reflexes and the concomitant appearance of other reflexes and gradual assumption of voluntary control of movement are the outward signs of this process of maturation. Some neonatal reflexes diminish in extent and intensity until they can no longer be elicited, for example, the Moro reflex (Mitchell, 1960); others are gradually overtaken by and appear to be incorporated into a voluntary response, for example, the supporting reaction, (Paine et al., 1964). The evolution of infantile reflexes is a continuing process, in which responses are modified as the child develops.

During this early, automatic phase of development, muscle tone and posture are important indications of the neurological state of the child. Tone and posture are connected not only by the nervous activity involved, but by their direct effect on each other; changes in muscle tone produce changes in posture and, particularly while the nervous system is still in a comparatively primitive form, changes in posture cause alteration in muscle tone. This effect decreases with increasing maturation of the central nervous system (Ingram, 1959).

For the first few weeks of life, muscle tone is mainly flexor. This flexor tone gradually decreases until, by 4 months of age, it is no longer predominant in the upper limbs. A transient extensor stage, lasting only a few weeks, normally occurrs around the age of 5 to 6 months and is followed by the second flexor stage. At 12 months of age, the second extensor stage is normally reached; the child can then assume the upright posture and the development of walking and allied skills is possible.

Many reflexes have been described as occurring during the first few weeks of life (Prechtl and Beintema, 1964; Beintema, 1968). They are of doubtful value in developmental assessment as the way in which they are performed and the ease with which they can be elicited varies considerably, both in different healthy children and in the same children at different times (Ingram, 1962; Lenard et al., 1968). The observation of the posture and spontaneous movements of the child, with an assessment of his muscle tone, can be of much greater practical value.

Several estimates are available of the age range at which the various reflexes can be elicited; the ages given show considerable variation. This may be partly explained by variations in the definitions used. The same eponym has been applied to widely different responses by different investigators, for example, the Landau reflex. Paine and his colleagues (1964) considered that the Landau response was a description of the posture adopted by an infant held in ventral suspension and first described by Landau. André-Thomas and his co-workers (1960), describe the Landau reflex as an elevation of the lower

extremities, produced in response to passive extension of the head when the child is held in ventral suspension. Such different definitions must lead to confusion and differing estimates of the ages at which the signs can be elicited. Reflexes may be present in a complete or incomplete form; some workers only accept the complete form of the reaction, others include the incomplete form and so a further source of confusion is produced in assessing the time scale of the evolution of reflexes. The means employed to elicit the reflex can alter both the character of the response and the age at which it can no longer be obtained. (Touwen, 1971). In many instances, the suggested normal age range is an estimate based on the authors clinical experience gained with a possibly biased sample of children.
Paine and his colleagues (1964) wished to assess the development of postural reflexes in children with chronic brain syndromes and, as no adequate normative data was available, they attempted to assess the range of normal. Their sample of 100 normal children was highly selected and excluded all children who had suffered any possible perinatal hazard. They tried to see their sample children at 4 to 6 week intervals during the first year of life. Unfortunately, their results were based on examinations of only 66 of their sample.

In this study, an assessment was made of the child's muscle tone, posture and spontaneous activity, and an attempt made to elicit the major reflexes normally described as present during the first year of life (Form 2, Appendix 1).

The child's posture and spontaneous motor activity was observed while he was lying supine, on a firm surface, with his head in the midline. An assessment was also made of the child's resistance to passive movements and of his posture and movements when placed prone on a firm surface, held in a sitting position and when supported in vertical and ventral suspension. As the child matured, this procedure was modified; an active child of 40 weeks was unlikely to stay in the supine or prone position for more than a second or two.

As children with known abnormalities were excluded from this study, very few defects of posture or muscle tone were detected. The children of the main sample were 4 weeks old when first seen; the predominantly flexor tone of children at this age was evident. Although the tendon reflexes were tested at this and subsequent visits, the information obtained on this point at the 4 week visit is not available due to clerical and punching errors.

Two children of the 168 seen were thought to be abnormal at this stage; they exhibited little spontaneous movement when supine, had low resistance to passive movement and almost complete head lag when pulled to the sitting position. They had little head control when held in ventral and vertical suspension and the limbs of one of them hung limply in ventral suspension. This child was the only one in the sample whose hands were held clenched with the thumb enclosed by the fingures. When seen at 16 weeks, he still held his hands mainly clenched, but with the thumb out and was still ratherlimp and lacking in spontaneous movement. His environment was poor and the family moved and could not be traced after this visit. The other child described also came from a poor environment and had 3 siblings under 5 years of age; he was seen at each visit except the 52 week examination when his mother was in hospital for the birth of her fifth child. This child was more active when seen at 16 weeks but by 40 weeks, he was retarded in all areas of development.

One other child had a low resistance to passive movement and almost complete headlag when pulled to sitting. Two children seemed to be slightly hypertonic with increased resistance to all passive movements and two other children showed increased resistance to passive movement of the lower limbs only. All five children were normal at the next and subsequent examinations and at 52 weeks were within the normal developmental limits for the sample as a whole.

Transient hypertonus of the lower limbs was detected in one child at the 16 week examination but his subsequent progress was normal. By 16 weeks, 4 children had poorer head control when held in sitting than the rest of the sample; a further 5 children were slow in the development of a mature sitting posture at 28 weeks. These 9 children continued at a comparatively low level of performance in gross motor development for the rest of the survey.

At the 16 week examination, the muscle tone of the children was no longer predominantly flexor; in 131 (89%) of the 147 children examined, a triceps tendon jerk was obtained. In the neonate, the kneejerk is commonly followed by contraction of the adductors of both hips. This response is said to decrease as the children mature; Paine and his colleagues considered that it was present in 41% of their sample at 4 months. It was thought to be present in 70 (48%) of this sample at 16 weeks. At the subsequent examinations it was found that it was difficult to determine whether this response was present or not, as the childrens' legs were very active.

At 28 weeks, one child held his legs out at right angles to his body when supported in vertical suspension; at the 40 week examination 9 children of the main sample and 18 of the preliminary sample held their legs out in this manner and a total of 5 children still did this at 52 weeks of age. All these children were normal in all other respects. Such a posture has been described as characteristic of ataxic diplegia but Paine and his colleagues noted that it was adopted by 8 of their group of 66 normal children during their first year of life, and no abnormalities were detected subsequently. Drillien (1972) has suggested that this posture and transient neurological signs may occur in a substantial number of children during the first year of life, without any related motor abnormalities appearing during the first 2 or 3 years of life.

Thus when muscle tone and posture were examined, 2 of 168 children were identified as possibly abnormal at 4 weeks of age; a total of 22 other children had transient deviations from the normal level of muscle tone and development of limb control but these did not seem to be associated with developmental levels at one year of age. However, slow motor development was first detected in 4 children at 16 weeks and a further 5 children at 28 weeks of age, by their comparative lack of head control when held in the sitting posture.

It proved impossible to perform adequate tests of hearing in many of the homes visited. But at each visit an attempt was made to ensure that the child responded to his own name, spoken softly, high pitched sibilants and rustling paper. In three children of the main sample and 2 of the preliminary sample it was thought that there might be some degree of hearing defect. All 5 children were subsequently tested at the infant welfare clinic which they normally attended; 3 children were considered normal on this testing and 2 referred for specialist examination.

At each visit, the eyes were examined for evidence of ptosis or strabismus and tested for the presence of blinking reflex to strong light and pupillary reaction to weaker light. It was not possible to use vision testing procedures, under the conditions encountered. No abnormal responses to light were detected. One child had persistent strabismus and, at 52 weeks, was being kept under observation by the opthalmologist.

At each examination, an attempt was made to elicit the reflexes commonly present at that age level.

The feeding reflexes of retrusion, sucking and rooting were tested at the four week visit only. If the retrusion reflex is present feeding is difficult to accomplish; it consists of protrusion of the tongue when an object, for example a finger tip, is placed upon it. It was not present in any of the children seen and none of the children had a persistantly protruding tongue. In the rooting response, the corners of a child's mouth are stimulated in turn by the examiner's finger; the child reacts by turning his head towards the side stimulated and trying to suck the stimulating finger. The sucking response is elicited by placing a finger in the child's mouth, rhythmic sucking can then be felt. Both the rooting and sucking reflexes were present in all the 168 children seen.

The primitive grasp reflex diminishes in intensity as the infant matures and merges with the developing voluntary grasp. The items in the examination concerned with the maturation of voluntary grasp were amongst those for which a scoring system was devised and will be discussed more fully later; some aspects are relevant at this point. The palmar grasp was elicited by placing a finger on the palmar surface of the hands, while the child was lying symmetrically in the supine position. All the children seen at 4 weeks gave a normal symmetrical response, flexing their fingers around the examiner's finger and gripping strongly for a few seconds. By 16 weeks, only a weak response was obtained in all the 147 children examined. This was symmetrical in each case and the children had begun to grasp small toys in a voluntary manner; Touwen (1971) found that the reflex grasp was still present in all 27 children of his sample at 16 weeks of age.

The plantar grasp was tested by pressing the balls of the infants feet with the examiner's thumbs; a normal response of plantar flexion of all toes was obtained in all the children examined at 4 and again at 16 weeks. By 28 weeks the response obtained was indefinite and inconsistent.

After the child's posture and spontaneous movements in the supine position had been observed, an attempt was made to elicit the "allongement croisée" or cortical crossed extension reflex, the magnet response and the withdrawal response of the lower limbs. André-Thomas (1960) states that in the neonatal crossed extension reflex, stimulation of the sole of one foot, with that leg held in extension, produces flexion only in the opposite leg; this reaction fades during the first month and is replaced by the "alloingement croisée" response where the unstimulated leg first flexes and then extends, passing along the side of the stimulated leg. In the magnet response, when light pressure is applied to the soles of the feet, with the lower limbs in a semi-flexed position, the lower limbs are extended. Both of these reflexes were thought to be present in all the children seen at 4 weeks of age; by 16 weeks, the increasing activity of the lower limbs made it impossible to accurately assess these responses. Pricking the sole of the foot produces a withdrawal reflex with extension of the toes, dorsiflexion of the foot and flexion of the leg and thigh. This reaction was observed in all the children at 4 and 16 weeks of age but was obscured by a voluntary response by 28 weeks.

The asymmetrical tonic neck reflex and the neck righting reflex were also tested while the child was in the supine position. The tonic neck reflex was testedby rotating the child's head to either side, the shoulders being kept horizontal, while the child was supine. A positive response is shown by extension of the arm and leg on the side toward which the face is rotated, with flexion of the limbs on the side of the occiput. The response is normally more marked in the upper limbs. The neck righting reflex tends to replace the tonic neck reflex as this disappears with age; in the neck righting reflex, when the head is turned to one side, with the body in the supine position, the shoulders, the trunk and then the pelvis rotate in the same direction, as if the child is going to roll over onto his side. Once the child can roll over from supine to prone, this reaction is obscured by voluntary movement.

The tonic neck reflex and neck righting reflex must have co-existed in some of the children seen by Paine and his colleagues (1964) in their survey; they considered that 80% of children exhibited the tonix neck reflex and 23% the neck righting reflex at 2 months of age. In 67% of the children seen by them at one month, the tonic neck reflex could be elicited; this rose to the maximum of 80% at 2 months and then gradually decreased to 13% at 6 months. They considered that the presence of the tonic neck reflex after this age was abnormal. In this study, the tonic neck reflex was elicited in all but 12 (7%) of the children seen at 4 weeks. The strength of the reaction varied considerably and was frequently transient; in no case was it obligate. By 16 weeks, the reflex was imposable, at least transiently, on 114 (77%) of those seen and it could not be imposed on any of those seen at 28 weeks.

Paine and his colleagues considered that the neck righting reflex could be imposed on 13% of children at one month and this percentage rose steadily to 67% at 9 months and 100% at 10, 11 and 12 months. In the Glasgow children, the reflex was not definitely observed until the 16 week examination when it was present in only 13 (9%) of the children; by 28 weeks, 83 children (53%) were reported to be capable of rolling from supine to prone and the reflex was present in 143 (93%) of the children seen. By the 40 week examination, the children were sufficiently active to obscure this response by voluntary activity.

The Moro response was elicited by the "head-drop" as first described by Sanford in 1933. In this method, the child is held in the supine position with one of the examiner's hands supporting his trunk and the other his head and neck; the hand supporting the head and neck is removed suddenly, allowing the head to drop through an angle of about 30° in relation to the trunk. The complete Moro response consists of extension and abduction of the upper limbs with extension of the spine and retraction of the head, followed by a movement of the hands together in front of the body and then a return to the position of flexion and adduction (Mitchell, 1960). As the child matures, a modified response may occur with incomplete extension of the upper limbs which may be followed by a flexor phase. The Moro response was present in some form in all the children seen at 4 weeks of age; it was present in its complete form in 127 (75%) of the children and was very easy to elicit in 4 of these. By 16 weeks it could still be elicited in some form in 117 (80%) of those seen but by 28 weeks, it could not be produced in any of the children examined. Paine and his colleagues considered that the Moro response was present in 93% of their sample, in some form at one month and in 59% at 4 months. It could not be elicited in any of their sample at 6 months and they considered that its presence at this age was abnormal. The results obtained in this study suggest that the proportion of Glasgow children in whom the Moro response and the tonic neck reflex can be elicited on examination at 4 and 16 weeks, is higher than that obtained in Paine's work; in neither study was either response obtained at 6 months or beyond. The Glasgow children also seemed to develop a neck righting reflex at an earlier stage than the children in the American study. These differences may be due to the use of different diagnostic criteria and the comparatively small samples examined, also the American sample was highly selected and, in the Glasgow sample, many of the children had been subjected to possible obstetric hazards.

After the observation of the child in the supine position and the eliciting of the reflexes described above, the child was pulled to the sitting position and his posture when held in sitting noted. His behaviour in the prone position was then observed and he was held in ventral suspension to assess his posture and tone in this position. At this point an attempt was made to elicit the Landau reflex, described by André-Thomas. No consistent response of the limbs could be obtained to passive extension of the head; this has also been the experience of several other investigators as reported by Paine and his colleagues. At this stage in the examination of the younger children, the trunk elevating or righting response was tested by supporting the child with his body flexed and his back against the examiner's body and dorsiflexing the child's feet. If the response is present, the child gradually extends his legs, trunk and neck. The trunk elevating response is one of the more primitive reflexes and was present in 160 (95%) of the children seen at 4 weeks of age but had disappeared completely by the 16 week examination.

In the older children, the parachute or precipitation reflex was looked for at this point in the examination, by plunging the child face downwards towards a flat surface from a position of horizontal suspension. If the reflex is present, the child extends his arms in front of him, slightly abducted at the shoulder, the fingers spread out as if to break his fall. This reaction normally appears around 7 months of age and is commonly present by 9 months, however its absence at one year of age is not necessarily abnormal (Paine and Oppe, 1966). In this study, it was present in 75 (49%) of the 154 children seen at 28 weeks; this is similar to the 42% response noted by Paine and his colleagues at 6 and 7 months. The response was absent in 11 (4%) of the total of 250 children seen at 40 weeks and in only 2 of those seen at 52 weeks; Paine obtained a 79% response at 10 months and 100% response at one year.

The child was held in vertical suspension and his posture noted and was then lowered until his feet made firm contact with a flat surface, while still being supported vertically. In this way the positive supporting reaction was tested and an estimate made of the proportion of the body weight supported by the child. In the young infant the presence of the stepping reaction or automatic walking was sought at this stage by shifting the axis of the child's supported trunk. The placing reaction was tested by suspending the child vertically with the examiner's hands under the axilla so that the dorsa of the child's feet could be brought up under the table edge. The child responds by plantar flexion of the ankle, flexion of the knee and hip and elevation of the leg with the foot placed firmly on the table surface.

The placing response was present in all infants at the 4 week examination but could not be definitely identified at later examinations. The stepping reaction tends to be inconsistent and may be detected intermittently in the same child during the first few weeks of life. Its presence was noted in 122 (73%) of the 168 children seen at 4 weeks.

The supporting reflex merges into active support of the lower limbs as maturation proceeds; the new born child tends to support his weight in a slightly crouching position, bent at knee and hips, in contrast with the straight legged appearance of the older child. However, as the two types of supporting tend to merge into each other and any assessment is based on personal estimate by the examiner of the extent of the weight bearing, the comparison of results obtained by different authors is difficult. There may be a period, commonly around 4 months when the child will bear no weight and seems to be between the primitive and mature forms of weight bearing. In this study, it was considered that at 4 weeks 132 (79%) of children exhibited the primitive type of weight bearing and the remaining 21% would bear no weight. By 16 weeks there were 18 children (12%) who still showed the primitive form of supporting reaction, 34 (23%) who bore no weight and the remaining 95 (65%) had started to develop the mature type of weight bearing. By 28 weeks, no children showed the primitive supporting reaction although 25 (16%) still bore no weight. 13 (5%) of the 250 children seen at 40 weeks and 3 (1%) of the 214 children seen at 52 weeks were not weight bearing. The 3 children who were not weight bearing by 52 weeks, were rather slow in their general gross motor development but the other 10 children who were not weight bearing at 40 weeks of age had progressed by 52 weeks and were within the normal limits of the samples for gross motor development.

The integrity of the central nervous system of the child is best shown by normal motor function and normal motor development. In this survey, no children who later proved to be abnormal or retarded in their development would have been detected during the first year of life by an examination of any or all of the reflexes described. Reduced muscle tone and a lack of spontaneous motor activity in the first few months of life does seem to be a possible indication of retarded motor and developmental progress in later childhood but as only 2 such cases were noted in this study, definite conclusions cannot be drawn.

HAND REGARD

The items on Form 2 concerned with hand-eye co-ordination and motor development which are commonly part of a neurological examination of a young child, were included in the scoring system devised for this survey and will be discussed fully in connection with this aspect of the work. It may be of value to mention a few points from these items at this stage.

It is commonly held that before an infant can develop full voluntary control of his body, he must first be aware of the existence and capacity of the parts of his body; he must have developed a "body image". With increasing visual awareness, the child begins to explore his immediate surroundings and, during the third and fourth month of life, most infants spend a large proportion of their waking hours apparently examining their hands, which they constantly manoeuvre in front of their eyes (White, 1969). Hand regard is said to commence at about 12 weeks of age and to be present until around 24 weeks of age, Many authorities consider that its persistence to the age of 28 weeks is abnormal (Illingworth 1970). In this study 29 (20%) of the 147 children seen at 16 weeks were observed to be taking a great interest in their hands, and in all except one child, the mothers reported that hand regard did occur; the one child who showed no interest in his hands was one of the two children with hypotonia and poor spontaneous movement, already described. At the 28 week examination, the investigator was surprised to find that many mothers volunteered the information that "He still spends hours looking at his fingers". 7 children were observed still to be showing great interest in their hands, while the examiner was talking to the mother; these children showed no abnormalities and were well within the normal range of development for the sample at subsequent examinations. In only 8 children did the mothers report that hand regard had ceased. There appears to be little in the literature on the observed disappearance of hand regard; in this sample it was normal for hand regard to be present at 28 weeks of age. In the children seen at 40 weeks, there were no reports of hand regard still occurring. It is not possible, therefore, to suggest the age range of its cessation from the evidence available here.

FEET PLAY

At the same time as the child's visual interest in his hands is developing, he is beginning to use his hands in exploring his surroundings; he pulls at his clothes and body, brings his hands to his mouth and begins to bring objects to his mouth; his fingers scrabble at the surface on which he is placed and at any objects within reach. Sheridan (1971b) has suggested that a child cannot sit unsupported until he can grasp his feet in his hands while supine and so, presumably, "knows where they are". In this study, 57 (37%) of the 154 children seen at 28 weeks could sit for a period of several minutes, unsupported on a firm surface and 14 of these could sit unsupported for an indefinite period. 98 (64%) of the children were seen to grasp their toes while in the supine position and the mothers of all except 7 of the rest of the sample reported that the children did grasp their feet when lying supine. None of the children were observed to pull their feet to their mouths but 102 (66%) were reported to do so. The relationship between these 3 items is shown in Table XXIII.

TABLE XXIII - Relationship between sitting without support, ability to grasp feet when in supine, and to carry feet to mouth at 28 weeks of age.

	Ability to sit unsupported			Total
	Absent	for 10 min.	Indefinitely	
Total grasps toes	97	43	14	
No	7	-	-	7(4.5%)
Yes-history	37	10	2	49(31.8%)
Yes-observed	43	33	12	98(63.6%)

(Table XXIII - Cont..)

	Ability to sit unsupported			Total
	Absent	for 10 min	Indefinitely	
Pulls feet to Mouth				
No	39	11	2	52(33.8%)
Yes-history	58	32	12	102(66.2%)

There is evidence to indicate that, when a child first acquires a skill, its presence is inconsistent (Gessel et al., 1947);(Touwen, 1971) so it is likely that not all of the children who were capable of grasping their toes would be seen to do so by the examiner; it is also possible thatthe history obtained from the mothers may err a little in a way likely to enhance the child's achievements. It can be seen from Table XXIII that none of the seven children who were not able to grasp their toes were able to sit unsupported; a larger proportion of the children who were able to sit were observed to grasp their feet and reported to pull their feet to their mouth. This was even more marked for the 14 children who could sit unsupported for an indefinite period but the numbers involved were too small for this observation to be anything more than an indication of a relationship. However, when the children who could sit unsupported for several minutes were considered together with those who could sit unsupported indefinitely, it was found that a significantly higher proportion of these children were observed to be able to grasp their toes ($X^2 = 6.91$, $p < .01$) and were reported to be able to pull their feet to their mouth ($X^2 = 4.11$, $p < .05$). Thus, although the design of this study makes it impossible to prove thatchildren must be able to grasp their feet while lying in supine, before they can sit unsupported, the strong association shown between these two skills in 154 children examined at 28 weeks of age, does suggest that this is likely to be the case.

DEVELOPMENTAL PROGRESS OF THE STUDY CHILDREN

The multiplicity of developmental schedules and the variation in the age levels at which the compilers of such schedules have placed developmental achievements have been discussed. Other investigators have commented that some scales seem to be pitched too low for the achievement levels of normal children (Hindley, 1960) and that the scales frequently produce inconsistent results, some items being too low and others too high, even on the same sub-scale (Klackenberg-Larsson and Stensson, 1968). Liddicot (1969) considered thatthe Bantu children observed by him were advanced in their development of most gross motor skills and the fine motor skill of prehension when compared to thestandards given in the scales of Gesell, Bayley and Griffiths. Jamaican children have been reported to show accelerated gross motor development when compared to the standards of Gesell (Grantham-McGregor and Back, 1971). Racial differences have been suggested to explain such findings but Hindley (1968) found considerable variation in the ages at which comparable groups of children from 5 European countries first walked alone. Dales (1969), in a study of the motor and language development of twins, also noted that his singleton controls exceeded Gesell's norms at all age levels studied.

Where possible, the performance of both samples of Glasgow children in this study was compared with the standards of other scales and schedules. As the children were seen at intervals of 12 weeks, it was not possible to assess the age ranges at which the majority of skills first appeared. Therefore it was not possible to compare the study childrens' performance with the scales produced by cross-sectional studies (Frankenberg and Dodds, 1967) or frequent examination associated with continuous observation in a nursery (Zdanska-Brincken and Wolanski, 1969). With the main sample an attempt was made to assess the age range for sitting unsupported.

AGE AT SITTING UNSUPPORTED

14 (9%) of the 154 children seen at 28 weeks of age were already able to sit unsupported on the floor, for an indefinite period, and a further 25% of the children seemed likely to develop this skill within a few weeks of that examination. At the 40 week visit, the mothers were questioned about the age at which their children could sit steadily on the floor for an indefinite time. This was further explained to the mother as being the age at which the child sat well enough, unsupported, for her to feel able to answer a doorbell or telephone, leaving the child sitting on the floor, without the fear that the child would topple over in her absence. In this way, a reasonable estimate was obtained; many mothers were able to date the age at sitting with reference to the previous visit at 28 weeks.

153 children were seen at 40 weeks of age, a further 2 children were not seen at 40 weeks but were already sitting at the 28 week visit, and 9 children achieved this skill at or after 40 weeks of age. The age range for this achievement was from 20 to 48 weeks for the 155 children on whom information was available. The histogram in Diagram 3 indicates that there was a tendency for more mothers to report the achievement of sitting alone in "even" than in "odd"weeks; a frequency polygon with the distribution of the age of achievement by intervals of 2 weeks is shown in Diagram 4. The distribution of the ages of achievement is approximately symmetrical around the modal value of 32 weeks with a mean value of 33.1 weeks (S.D. = 4.5)

DIAGRAM 3. Distribution of childrens' ages at sitting alone.

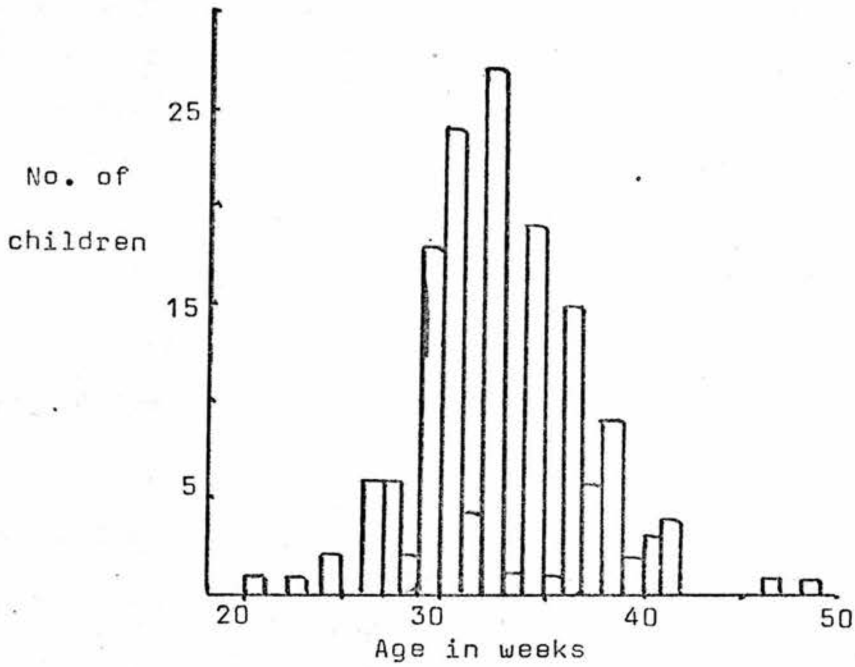


DIAGRAM 4. Frequency polygon of childrens' ages at sitting alone on examiner's assessment and on mothers' history.

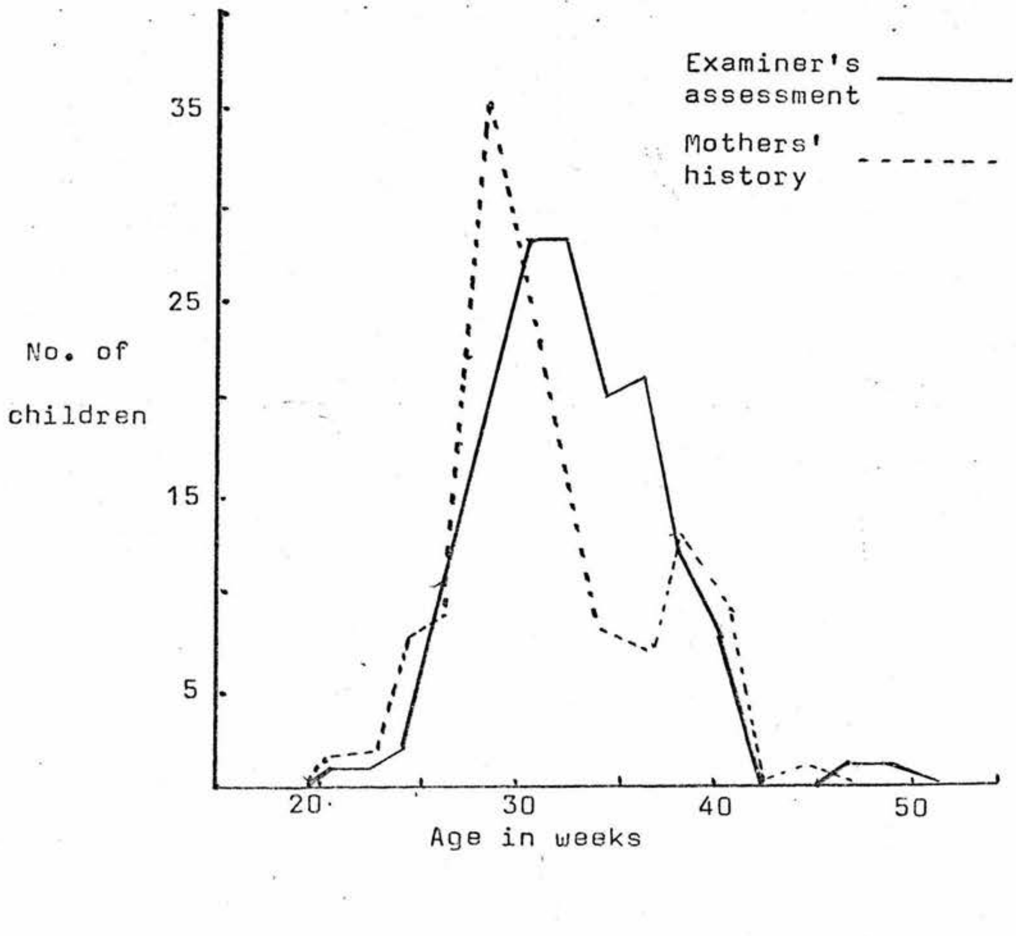


TABLE XXIV - Ages at first sitting alone for 155 children

Mode - 32 weeks

Median - 32 weeks

Mean - 33.1 S.D. = 4.5

-2 S.D.	24.1	2½%	24.0*
-1 S.D.	28.6	16 %	29
Mean	33.1	50 %	32
+1 S.D.	37.6	84 %	37.2
+2 S.D.	42.1	97½%	41.5

* The figures in this column are of the age in weeks, when it was estimated that the percentage of children shown achieved the sitting position.

This finding is in conflict with that of Neligan and Prudham (1969) who found that for the 'milestone' of sitting unsupported for a minimum period of one minute, the age difference between the 97th percentile and the 50th percentile was almost twice that between the 3rd and the 50th percentile. Frankenberg and Dodds noted a similarly skewed distribution for age at sitting without support and for most other developmental achievements in their cross sectional study. As the definitions of sitting unsupported used in these studies differ from that of the present study, the actual age ranges are not comparable. Gesell (1947) and Illingworth (1970) state that the normal child sits steadily for an indefinite period at 40 weeks of age; in this study 149 (95%) of the 155 children in the main sample, on whom information was available were sitting steadily at 40 weeks.

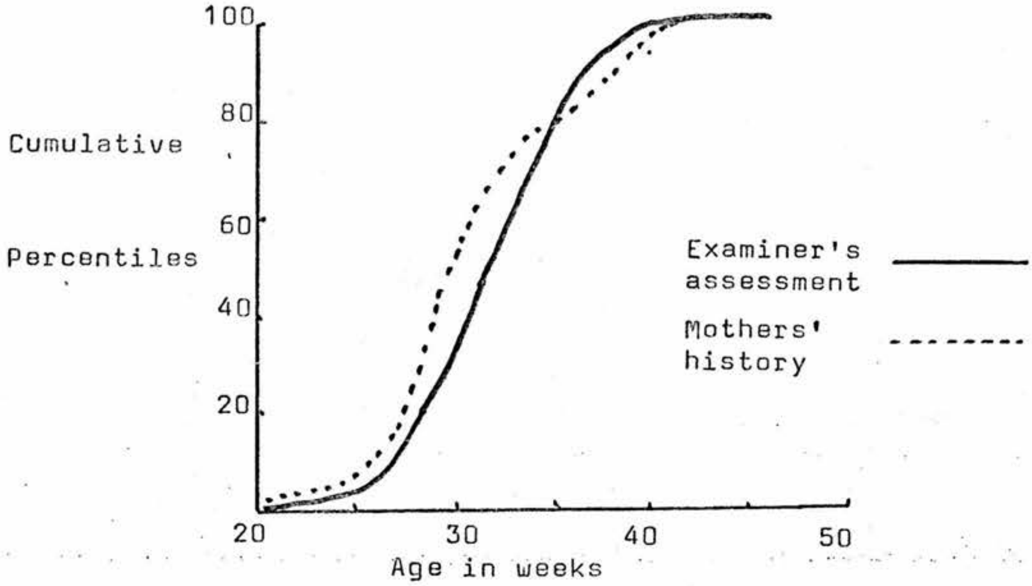
The information used by Neligan and Prudham in their

Newcastle study was gathered by health visitors during their routine contacts with the mothers of almost 4,000 young children; the time which had elapsed between the child achieving the milestone of sitting unsupported and the mother reporting this achievement is not known. The mothers seen at the 52 week visit in this study were again asked about the age at which their child sat alone, steadily, for an indefinite period. The reported age was accepted without prompting or correction. The mother's history of the child's achievement was obtained from 138 mothers whose child had been sitting by 40 weeks. The frequency polygon for these observations is shown, with that for the examiner's estimates, in Diagram 4. The age distribution is skewed to the left; the mean of the observations is 31.0 weeks, as compared to the mean of 32.4 weeks for the examiner's estimate of age at sitting of these 138 children, but 35 (25%) of the children were reported to have been sitting alone by 28 weeks, the modal value of the mothers' observations.

The cumulative percentile curves for the mothers' observations and the examiner's estimates are shown in Diagram 5. The curve for the mothers' observations is similar in shape to that obtained in the Newcastle study, with an estimated age difference of 7 weeks between the 3rd and 50th percentiles and of 11 weeks between the 50th and 97th percentiles. It is possible, therefore, that the apparent discrepancy between the results obtained in this study and in the Newcastle study can be explained by the differences in the means of collecting the data used in the studies.

The distribution by social class and family size in this group

Diagram 5. Cumulative percentile curves for childrens' ages at sitting alone on examiner's assessment and on mothers' history.



Age in weeks	Examiner's assessment No.	Cumulative Total	%	Mothers' history No.	Cumulative Total	%
<22	1	1	0.7	2	2	1.5
22-	1	2	1.5	2	4	2.9
24-	3	5	3.6	8	12	5.8
26-	10	15	11.0	9	21	15.2
28-	17	32	23.2	36	57	41.3
30-	27	59	42.8	25	82	60.2
32-	24	83	61.0	17	99	72.7
34-	18	101	74.2	8	107	78.6
36-	19	120	88.2	7	114	83.7
38-	12	132	97.0	13	127	93.3
40-	6	138	100.0	10	137	99.3
42-	-	138	100.0	-	137	99.3
44-46	-	138	100.0	1	138	100.0

of 138 children was similar to that of the main sample as a whole. The observations of 57 mothers, when their children were 52 weeks old, of the age at which the child sat alone differed from the examiner's estimate by 4 weeks or more. Such differences were more likely to occur in mothers from the lower social classes ($p < .02$) but their incidence was not influenced by maternal age or family size. Where the difference between the two ages was 3 weeks or less, the mothers were as likely to give a higher age as a lower one; with differences of 4 weeks or more, there was a tendency for the mothers to give a lower and, possibly to them a "better", age for the achievement. This trend was not statistically significant (Table XXV). These larger differences were spread throughout the age range but the mothers whose children were comparatively late in sitting alone were more likely to give a"better" age in their history.

TABLE XXV - Distribution of differences of 4 weeks or more between mothers' histories and examiner's estimates.

Difference	No. Giving Lower Age	No. Giving Higher Age
4 or 5 wk.	15	10
6 or 7 wk.	13	6
8 or 9 wk.	6	2
10 weeks	4	1
Total	38	19

Thus in this sample of 155 Glasgow children, the age at sitting unsupported was distributed normally around the mean value of 33.1 weeks with a modal value of 32 weeks; the mothers' history of the age at sitting unsupported for 138 of these children, obtained at least 12 weeks after the achievement, gave an age distribution which was markedly skewed with a modal value of 28 weeks and a mean value of 31.0 weeks.

PERFORMANCE OF THE STUDY CHILDREN ON THREE DEVELOPMENTAL SCHEDULES

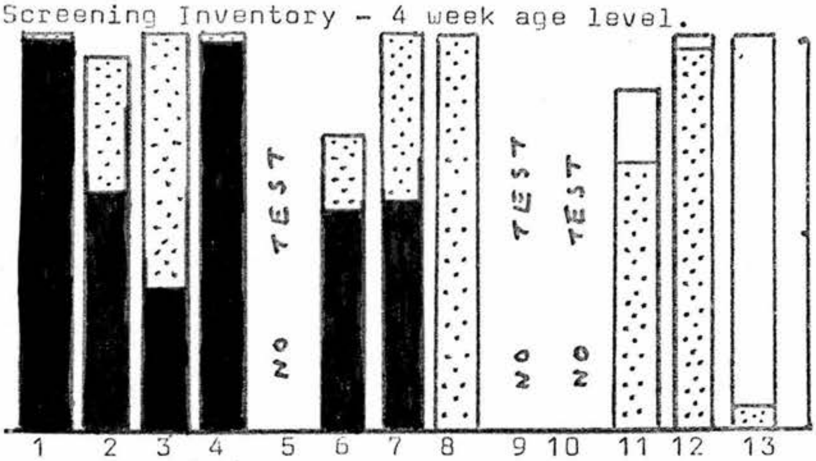
The achievements of the children seen at the 5 examinations of the study were compared with the items given at these age levels in various developmental schedules. In some cases, a direct comparison was not possible as many of the items listed in the schedules were not observed in a similar manner in the study. The items recorded during the study examinations corresponded well with those of Gesell Norms of Development (1947), Illingworth's description of the sequence of normal development (1970) and Sheridan's charts outlining the developmental progress of infants and young children (1968). Abbreviated forms of all three have been produced and the performance of the sample children at the appropriate age levels of these developmental schedules are illustrated in Diagrams 6 - 12.

Knobloch and her colleagues (1966) based the Developmental Screening Inventory (D.S.I.) on Gesell's schedules of development; the authors state that the age placement of an item is that at which roughly 50% of infants achieve success. Illingworth (1962) gives an outline of developmental progress, based on the fuller description contained in his book "The Development of Infants and Young Children", first published in 1960; in this book, he states that the age levels allotted to the various items are average ones. The D.S.I. and Illingworth's outline of normal development are designed to provide an indication of the maturity level reached by a child rather than a numerical developmental quotient. Sheridan's booklet "The Developmental Progress of Infants and Young Children" (1968) provides descriptions of the usual behaviour observed in normal children at intervals over the first 5 years of life. She points out that a child's performance level can vary from day to day and suggests that a child can be considered to be within normal limits if he gives a positive response to two thirds of the items listed for children in his age group. In 1971, Sheridan produced a shortened form of these descriptions covering the development of children to one year of age (Stycar Chart). The ages described in the Stycar chart are 4-6 weeks and 3, 6, 9 and 12 months so that three of the age levels do not correspond exactly with the ages at which the children were examined in this study. However, this chart and the booklet on which it is based are so widely used that it was decided to include the chart in this evaluation, with the performance of the samples at 16, 28 and 40 weeks compared with the Stycar chart items for 3, 6 and 9 months respectively. From the 6 month age level, the Stycar chart includes a test of vision, using graded balls (Sheridan, 1968). It was not possible to use this test under the conditions encountered in home visiting.

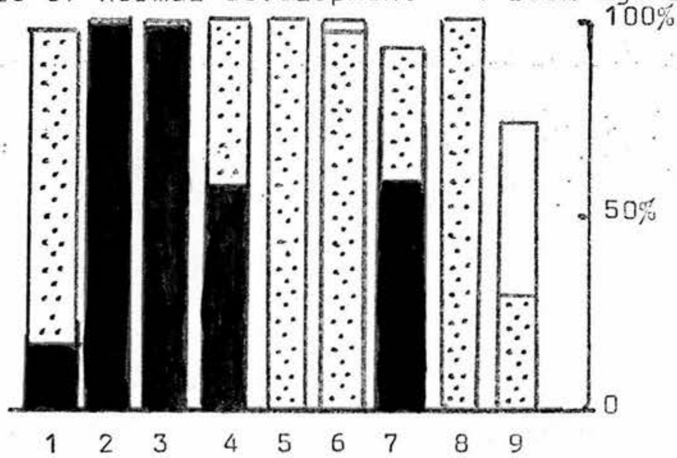
Lists of the items from which the Diagrams 6-12 were compiled are included in Appendix 3. Diagrams 6 - 9 and 11 represent the performance levels of the children of the main sample seen at the 4, 16, 28, 40 and 52 week visits. Diagrams 10 and 12 represent the performance levels of the children in the preliminary sample seen at the 40 and 52 week visits. The phrase "No test" in these diagrams indicates that this item was not recorded in the study in a manner which allowed it to be compared with the item in the schedule; in most cases an equivalent test was performed.

DIAGRAM 6. Performance of the main sample at 4 weeks.

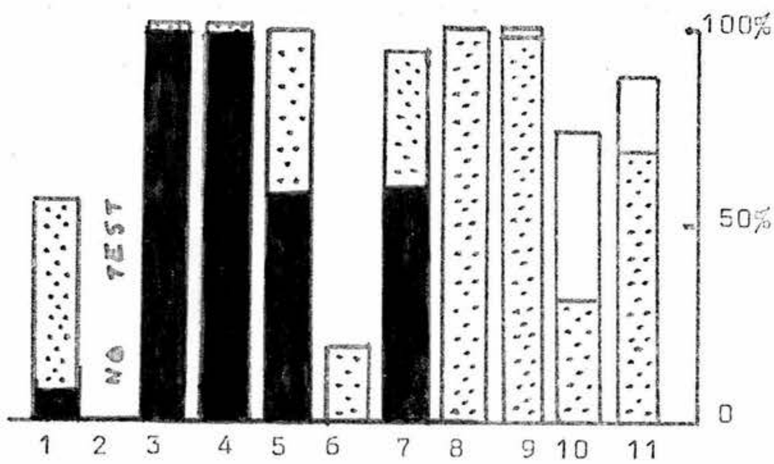
Developmental Screening Inventory - 4 week age level.



Illingworth's schedule of normal development - 4 week age level.



Stycar chart for 4-6 weeks.



Key

Achievement reported by mother

Observed achievement

Higher level of achievement

4 WEEK EXAMINATION

In diagram 6, the achievements of 168 children of the main sample at the 4 week examination are shown against the items of the D.S.I. and Illingworth's schedules at the 4 week age level and of the Stycar chart at the 4 - 6 week age level. Item 5 on the D.S.I. (D5) and item 2 on the Stycar chart (S2) were descriptions of the usual posture observed in children of this age; this could not be obtained in a similar way from the records of the study examination. Similarly, D9 and D10, describing the child's "impassive face" and "vague regard" had not been recorded in this way in the study.

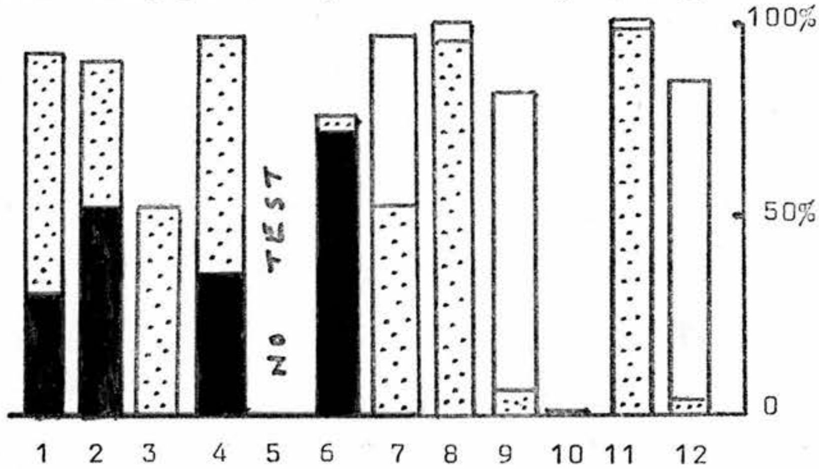
Only 4 items were common to all 3 scales. These were: the child's ability to follow a ring dangled about 6" above his head, when in the supine position, from the side to the midline (D2, item 7 on the Illingworth schedule - I7, and S7); the child's posture when held in a sitting position, head sagging forwards (D4, I3, S4); the manner in which the child's hands are held, normally tightly fisted at this age (D7, I4, S5); and the interest shown by the child in any adult who feeds or otherwise attends to him (D12, I6, S9). Two items appear at different levels in these scales. The manner in which the child holds his head when placed in the prone position is described as "clears nose from ground" in D6 but as "momentarily lifts chin" in S1; this item is placed at the 6 week age level by Illingworth. The position of the head when the child is held in ventral suspension is described by Illingworth as being intermittently in line with the body (I1) and in the Stycar chart as maintained in line with the body (S6); the D.S.I. places the ability to maintain the head in line with the body when held in ventral suspension, at the 8 week age level. The remaining 8 items are all included in 2 of the 3 scales. Thus even at the 4 week level, when the child's behaviour patterns are limited, the items included in these 3 scales show some variation.

The D.S.I. and Illingworth's schedules place items at the age level where they are achieved by 50% of children or the "average" child. Diagram 6 shows that more than 90% of the children examined accomplished most of the items, at this age level, on these two scales. Additionally, a considerable proportion of the children had reached a higher level of development of the skill represented by the items examined; more than 50% of the children were functioning at the level given for children 12 weeks of age on the items concerning the manner in which they looked at a toy, dangled before them (D1) and the way in which they normally held their hands when relaxed (D5, 14, S5). If the items included in these 2 schedules are performed by only 50% of the children of the population for which they were constructed, it would appear that the general level of development of this sample of Glasgow children is advanced at 4 weeks of age.

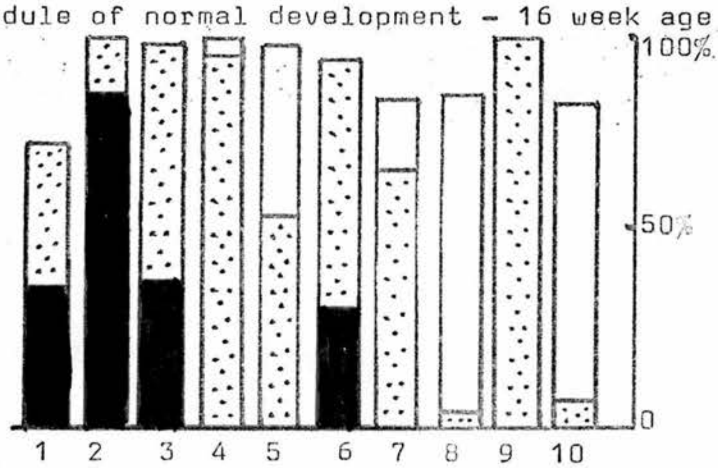
The Stycar chart provides a description of the usual behaviour of children, rather than the achievements of the average child. The numbers of children achieving the items varied from 27 (16%) for S6 to 168 (100%) for S3, 4, 5, 8 and 9. Despite this, the chart seems to provide a reasonable description of the behaviour of most children at this age level.

DIAGRAM 7. Performance of the main sample at 16 weeks.

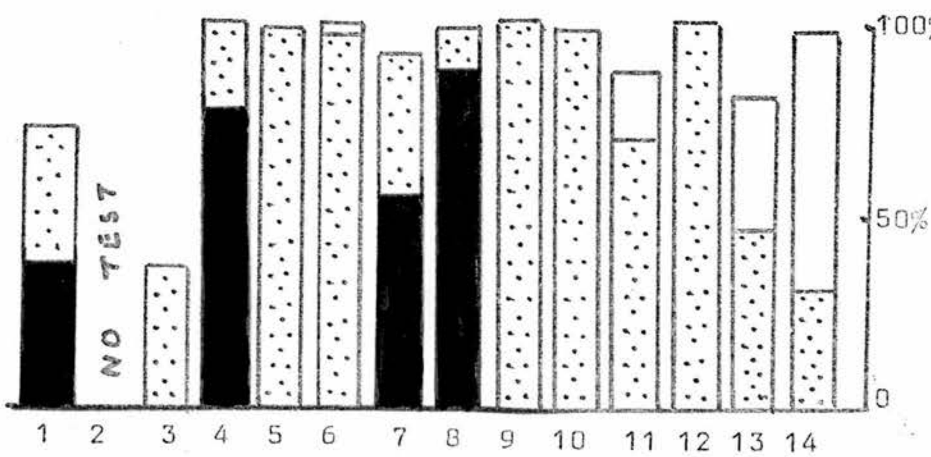
Developmental Screening Inventory - 16 week age level.



Illingworth's schedule of normal development - 16 week age level.



Stycar chart for 3 months.



16 WEEK EXAMINATION

Diagram 7 illustrates the achievements of the 147 children seen at 16 weeks on the items given in the D.S.I. and Illingworth's schedules for the 16 week age level and in the Stycar chart for the 3 month age level. The two "No test" items again refer to description of posture which were not recorded in a similar manner in the survey. At this age level, there was only one item common to all three scales; this described the manner in which the child at this age level brings his hands together in the midline and plays with his fingers (D8, I4, S6). Two skills are included at different levels of maturity in different scales. The maturity of the child's head control when supported in the sitting posture, was at a lower level in D4 and I3 than in S3 although the Stycar chart described the behaviour at 3 months, i.e. 12 or 13 weeks, and not 16 weeks as for the D?S.I. and Illingworth's schedules. D.6 describes the position of the head when the child is placed in the prone position as "held at 90°" but I1 and S1 state that at this age level, both the head and shoulders are off the couch and the child supports himself on his forearms, and this appears at the 20 week level in the D.S.I. American children appear to be placed in the prone position to sleep more often than British children and there is some evidence that they tend to develop the skills associated with the prone position more quickly. (Holt, 1960). Despite this, the American schedule places the development of control in the prone position at a later age than the British schedules. Of the remaining 18 items, 5 appear in two of the scales and 13 in only one scale.

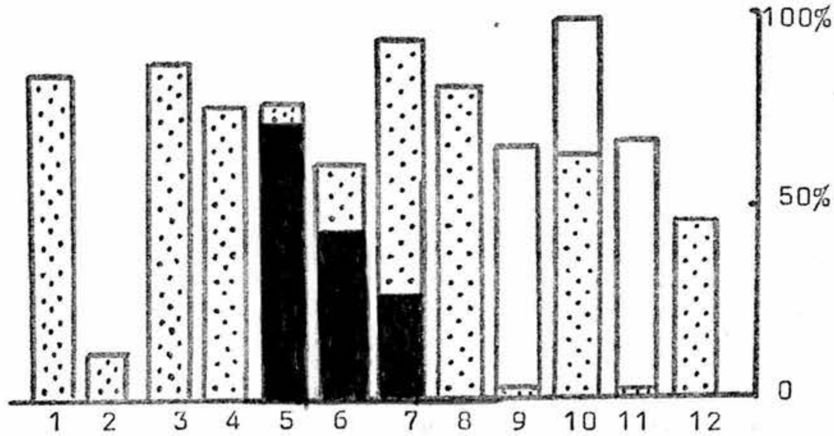
D2 and D3 refer to different maturity levels of the same skill, the reaction of the child when a toy is placed in his hand. Their presence at the same age level ensures that they cannot both be performed by roughly 50% of children; in this study, 57 (39%) of the children only looked at the toy when it was placed in their hand (D2) but a further 77 (52%) took it into their mouths (D3).

As at 4 weeks, more than 50% of the sample achieved most of the items of the D.S.I. and Illingworth schedules at 16 weeks. There was more variation between the various items than at 4 weeks; no children at all achieved D10 and the achievement of the other items varied from 52% for D3 to 100% for D8 and D11. On Illingworth's schedules, the achievement levels varied from 72% for I1 to 100% for I2, I4 and I9. Some childrenagain showed a higher level of skill on certain items but this was not so marked as at the 4 week age level; in no item were more than 50% of the children seen at 16 weeks performing at a level placed at 20 weeks or later in the schedules. However, the overall impression given by these two schedules is that this sample of Glasgow children remains advanced in their development at 16 weeks of age.

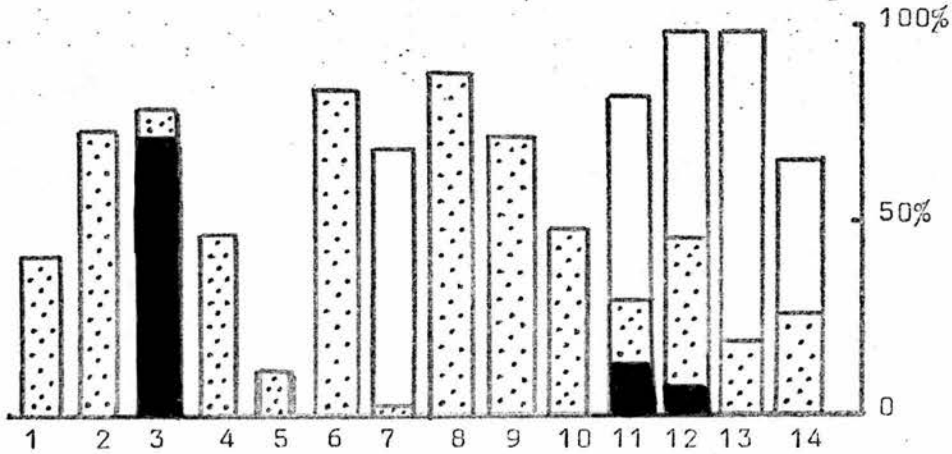
The Stycar chart describes the usual behaviour of 3 month old children. Apart from S3 which described a more mature type of behaviour than that described at 16 weeks in the other two schedules and which was achieved by only 54 (37%) of the children, more than 70% of the children performed all the items. It does appear to provide a reasonable description of the usual behaviour of the children studied. As the description was intended for children possibly 3 weeks younger than this sample, it was to be expected that most of the sample should be capable of achieving the items listed.

DIAGRAM 8. Performance of the main sample at 28 weeks.

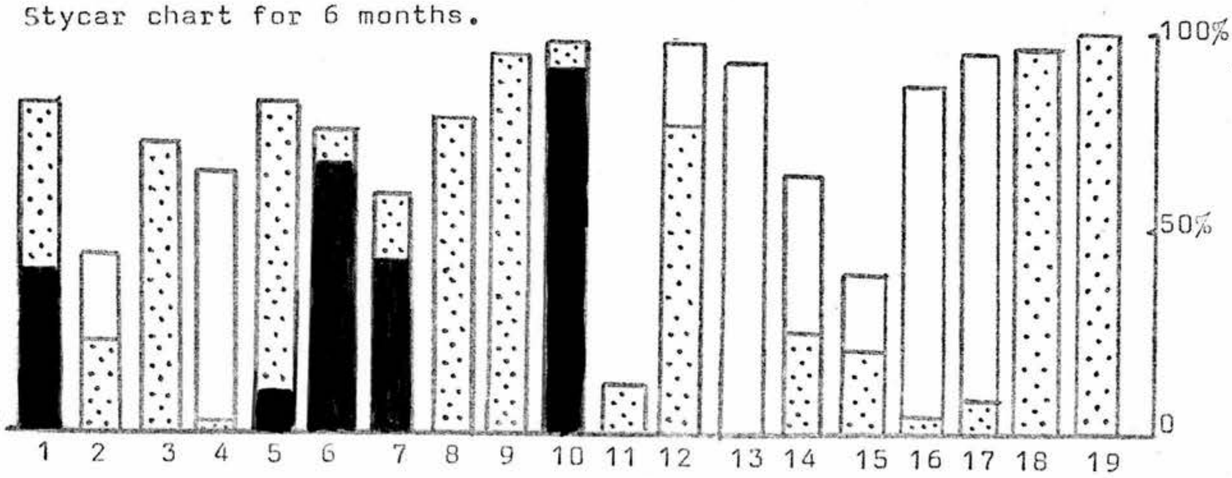
Developmental Screening Inventory - 28 week age level.



Illingworth's schedule of normal development - 28 week age level.



Stycar chart for 6 months.



28 WEEK EXAMINATION

At the 28 week age level the Stycar chart for 6 months was used; thus the difference between the children described by the chart and the children examined was 2 weeks. At this age level, the scales had 4 items in common. These were: the child reaches for and picks up a toy with one hand (D1, I6, S8); the child can transfer a toy from hand to hand (D2, I5, S11); the child can lift his head spontaneously when in supine (D4, I2, S3); and he sits on a hard surface leaning on his hands for support (D5, I3, S6). 4 items appear at different levels of maturity in the different scales. I4 describes the behaviour of the child when supported in the standing position at a more mature level than is described in D6 and S7. The language development described in I14 and S16 is more advanced than that in D10. The fine motor skill of prehension is expected to be at a more mature level in D7 than in S10. Although the Stycar chart is for the 6 month child and the D.S.I. is at the 28 week level, the former describes the usual behaviour of the children and the latter that of 50% of children so it would be reasonable to assume that the items included at 6 months and 28 weeks respectively, would be at approximately equivalent levels of maturity. Illingworth's schedules are also for the 28 week age level but he describes the normal position of the child in the prone position as less advanced than the description in the Stycar chart for 6 months (I1, S1). Of the remaining 19 items, 2 appear in 2 of the scales and the remaining 17 in only one scale.

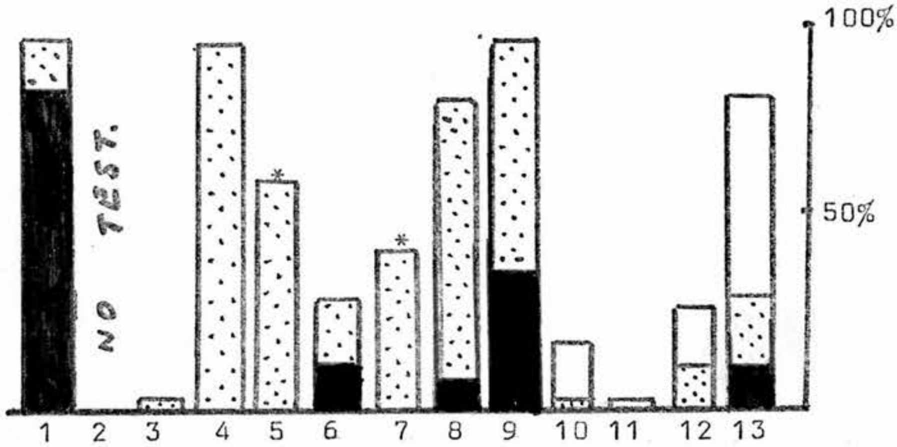
At this age level, fewer children achieve the items included in the D.S.I. and Illingworth's schedule for the 28 week age level. (Diagram 8). More than 50% of the 154 children do achieve most items;

the percentages vary from 12% to 98% on both schedules. The overlap of the childrens' performance between this and subsequent age levels has diminished and very few children achieved items placed at 32 weeks or above. Even so, on these schedules it would appear that the development of Glasgow children remains advanced at 28 weeks of age.

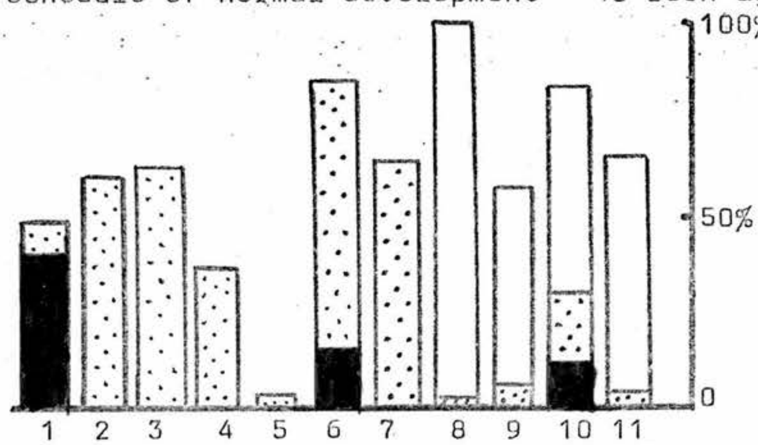
The proportion of children achieving the items included in the Stycar chart for 6 months varies from 12% for S11 to over 90% for S9, 10, 12, 13, 17, 18 and 19. As the children were examined at 28 weeks and not 6 months of age, it is reasonable to expect that most items would be accomplished by almost all the children examined. It was, therefore surprising to note that 88% of the children failed to achieve S11 and more than 50% of the children failed to achieve S2 and S15. However, as most children performed adequately on 16 of the 19 items, the Stycar chart seems, again, to provide a reasonably accurate description of the usual behaviour of a normal child of 6 months.

DIAGRAM 9. Performance of the main sample at 40 weeks.

Developmental Screening Inventory - 40 week age level.



Illingworth's schedule of normal development - 40 week age level.



Stycar chart for 9 months.

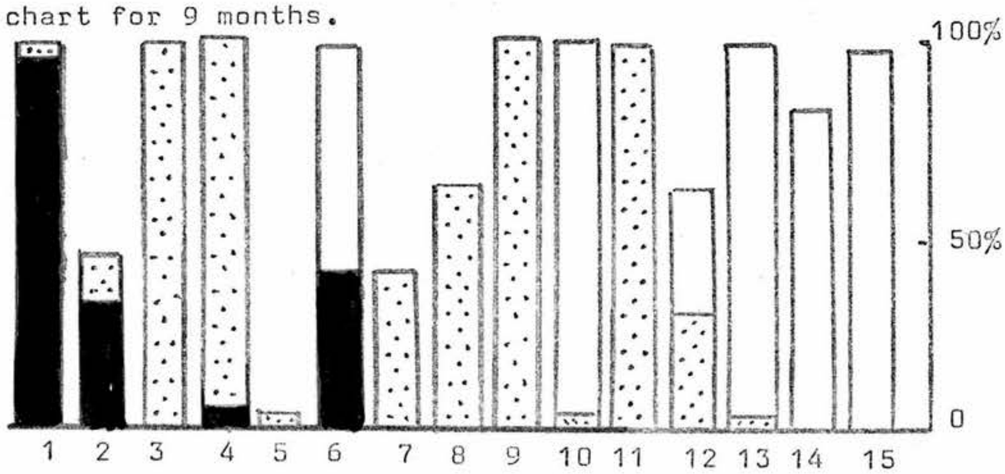
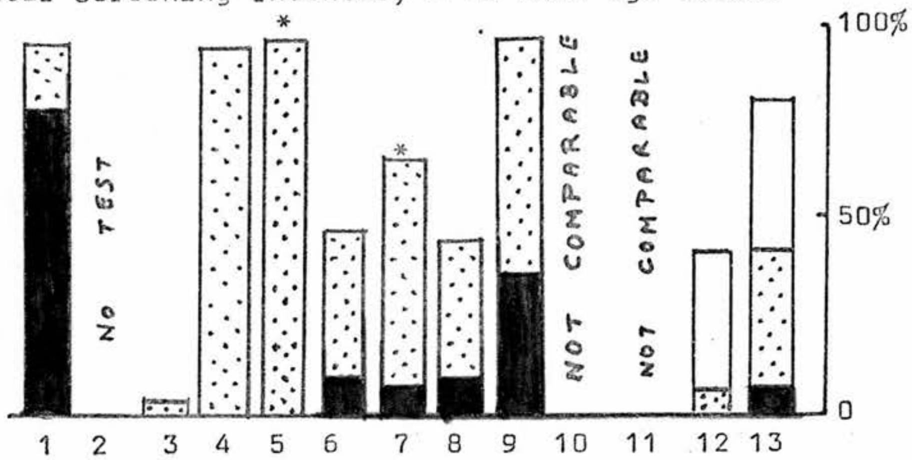
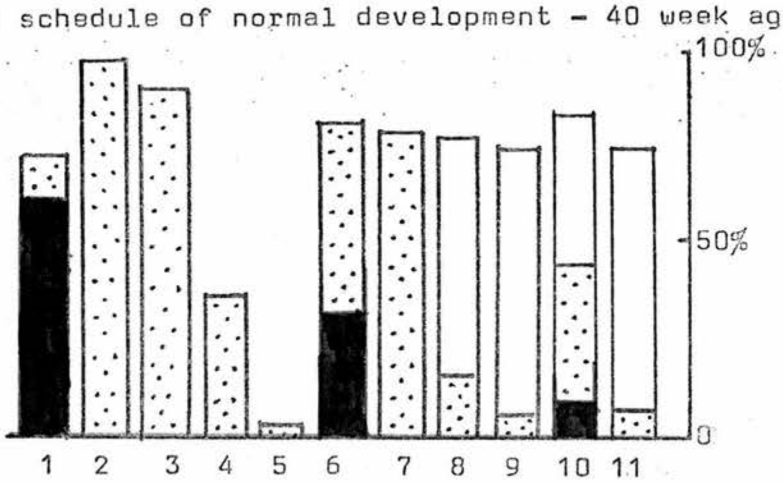


DIAGRAM 10. Performance of the preliminary sample at 40 weeks.

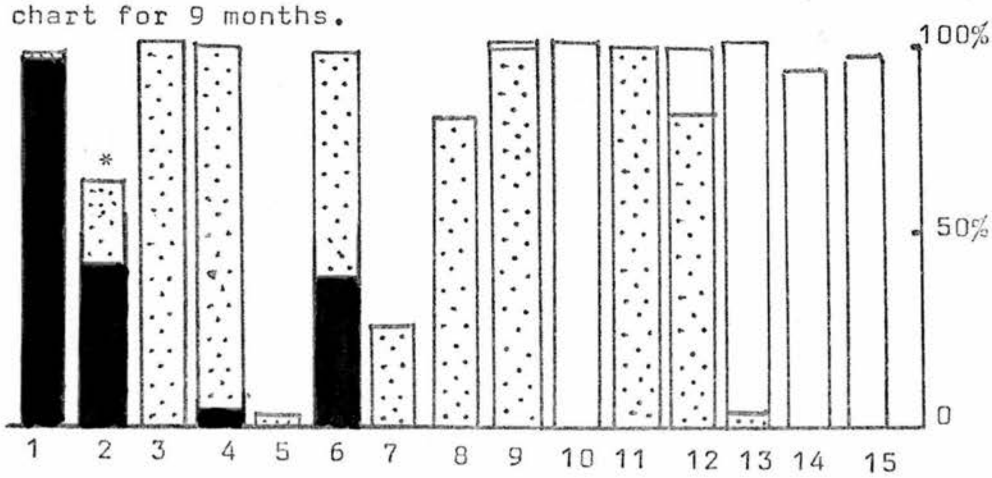
Developmental Screening Inventory - 40 week age level.



Illingworth's schedule of normal development - 40 week age level.



Stycar chart for 9 months.



40 WEEK EXAMINATION

Both the preliminary and the main samples were seen at the 40 and 52 week visits. The performance levels of the 2 samples on the 3 schedules differed on several items so the results are presented separately (Diagrams 9 - 12).

At the 40 week age level, D2 had no equivalent test item in the survey examination. In Diagram 10, D10 and D11 are marked as "Not comparable"; these items are concerned with the development of language ability. At the conclusion of the 40 week examinations of the preliminary sample, the investigator realised that, because of her initial inexperience in assessing language development, the records of this aspect of developmental progress were not reliable for that series of examinations and so could not be compared with those from the other examinations.

Only one item was common to all 3 scales at this age level, "child pokes with index finger at small objects", (D3, I5, S5). Only 2 (2%) of the preliminary sample and 5 (3%) of the main sample were observed to do this, although most texts on child development describes this "index-finger approach" as characteristic behaviour at 40 weeks of age. It is possible that the children had passed this stage and reached a higher form of development or it may be that this index-finger approach is an artefact, observed mainly in the environment of a clinic where most developmental assessments are performed. A sweet or small sugar-coated pellet is normally used for assessing this item; most children captured the sweet immediately and tried to get it to their mouths before the examiner or their mother could intervene. This would appear to be the normal reaction of a child when a sweet is placed before him in his own home. All 7 children who poked at the sweet with a finger were also noted as being shy and unco-operative during the examination. It may be that, in strange surroundings, a child would investigate any small object placed before him with a probing finger; no such hesitancy was apparent in the children seen in their own homes.

Three items were described at differing levels of achievement in the scales. The Stycar chart described behaviour at the 9 month (39 week) level and sitting development is described at a less mature level (S1) than in D4. I1 and D6 refer to the development of crawling and I1 is at a less mature level than D6. The developing skill of prehension of small objects is tested in D9, I4 and S6. The type of prehension described in I4 is at a higher level of development than that in D9 and S6. Of the remaining 24 items, 3 appear on 2 of the scales and 21 on only one scale.

Internal inconsistencies again appear on the D.S.I., D11, "Have one word other than ma-ma and da-da" is a stage beyond "say and mean ma-ma and da-da" which is item D10. Similarly, D12 "Play nursery trick just if asked" is a more mature type of behaviour than "Play nursery trick only if you do it first" which is item D13. It is, therefore, impossible that both items 10 and 11 and items 12 and 13 have been placed at the age level where roughly 50% of children achieve them.

At this age level, even when the item referring to the index finger approach to small objects is excluded, the proportions of the main sample achieving success on individual items of the D.S.I. and Illingworth's schedule ranged from 3% to 100%; the variability in achievement levels is surprising after the comparative consistency at the earlier age levels and is sufficient to suggest that these schedules may not provide a reliable guide to normal development at 40 weeks.

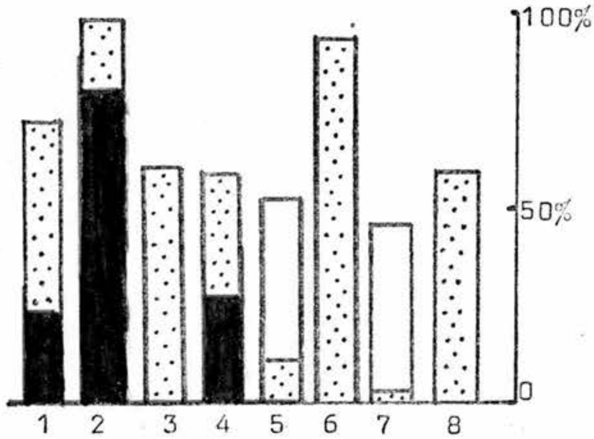
On the Stycar chart for 9 months, two-thirds of the items were achieved by more than 75% of the 153 children of the main sample who were seen at 40 weeks. But here too, variations have appeared in the achievements of the sample as a whole on individual items. The Stycar chart for this age level seems to provide a less accurate description of the usual activities of normal children than at the younger age levels.

There was a tendency for the achievement levels of the preliminary sample to be higher for items of gross motor development and lower for items of fine motor and adaptive behaviour, than those of the main sample. (Diagram 10). The relationship between the two samples for items of social development was more complicated. Most of these items could be marked only on the history obtained from the mother and, where the performance levels were taken only from the mother's history, the preliminary sample tended to have higher levels of achievement. However, on the few items where sufficient observations were obtained to enable comparisons to be made, there was no consistent difference in performance between the two samples. These general trends were confirmed by several items where the difference was statistically significant ($p < .05$) in each of the areas of development examined. Three such items of gross motor development were amongst those included in the schedules at the 40 week age level; they are marked with an asterisk in Diagram 5 (D5, D7 and S2). All 3 items are concerned with the development of the ability to sit steadily and to manipulate the body in the sitting position; in each case, the general level of development was higher in the preliminary than in the main sample. The performance on individual items was examined by social class and family size. The sub-groupings thus obtained were too small for statistically significant relationships to be detected but there was a definite tendency for gross motor development to be more advanced in the children from the lower social classes and for fine motor and adaptive behaviour to be more advanced in the children from the higher social classes and from the smaller families. Family size had no obvious effect on gross motor development. As the preliminary sample contained a larger proportion of children from the lower social classes and from large families than the main sample, these trends are probably sufficient to explain the better achievement levels shown on items of gross motor development and lower levels on items of fine motor and adaptive behaviour by the preliminary sample.

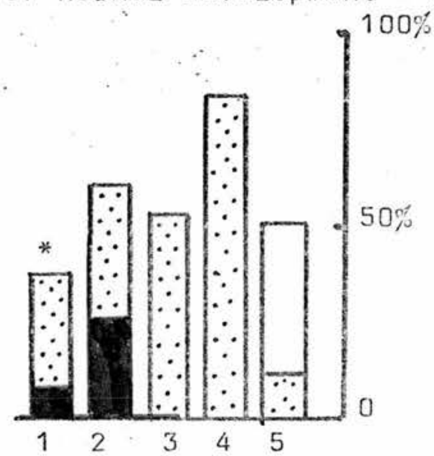
Social development was not influenced markedly by either social class or family size. As the differences of achievement on the social items between the two samples was confined to the items where the mothers' observations were accepted, it is possible that the differences between the two samples reflects the different relationships which the mothers of the samples had with the investigator. In the preliminary sample, the 40 week visit was the first contact between the investigator and the mothers; in the main sample, the 40 week visit was the fourth contact over a period of 36 weeks. It is possible that the mothers of the children in the preliminary sample were more likely to try to impress the investigator, consciously or unconsciously, with the prowess of their children than were the mothers of the main sample to whom the investigator was no longer a stranger. As the trend for the preliminary sample to exceed the achievements of the main sample in social dèvelopment was less marked at the 52 week level, this may be a possible explanation for the differences noted at the 40 week level.

DIAGRAM 11. Performance of the main sample at 52 weeks.

Developmental Screening Inventory - 52 week age level.



Illingworth's schedule of normal development - 52 week age level.



Stycar chart for 12 months.

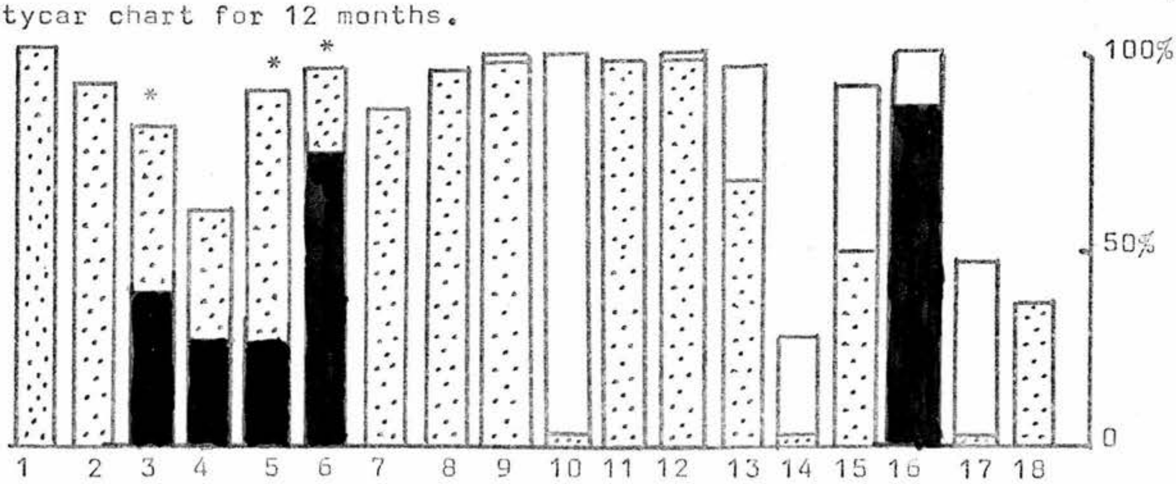
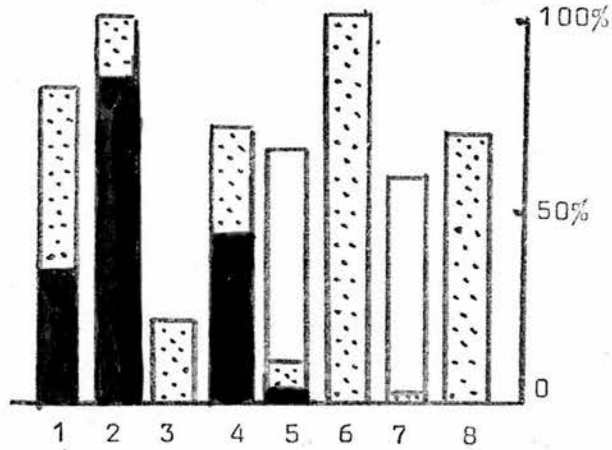
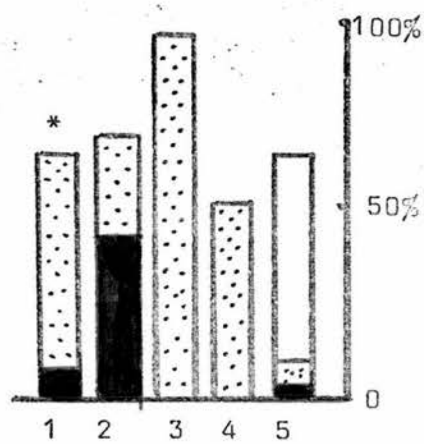


DIAGRAM 12. Performance of the preliminary sample at 52 weeks.

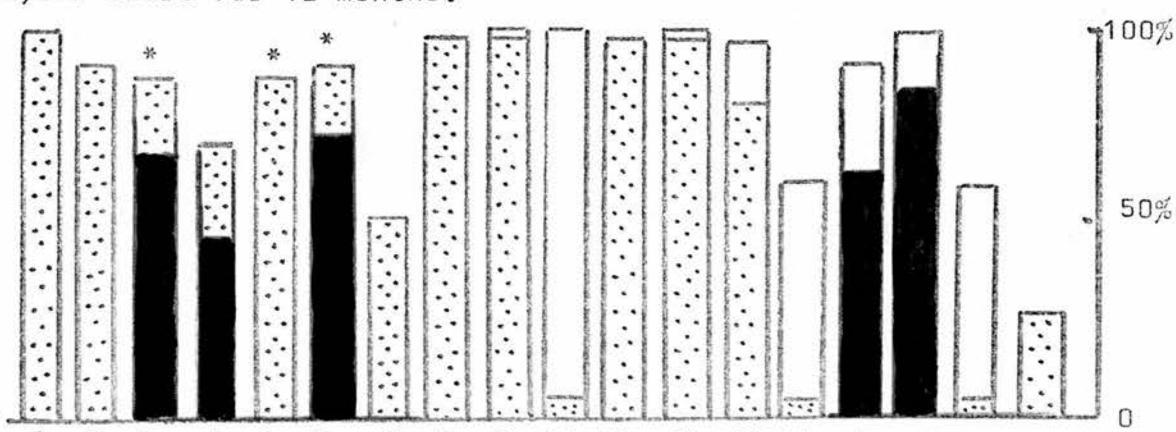
Developmental Screening Inventory - 52 week age level.



Illingworth's schedule of normal development - 52 week age level.



Stycar chart for 12 months.



52 WEEK EXAMINATION

The Stycar chart for one year describes the age level of the children examined at the final 52 week visit (Diagram 11). At this age level, one one item was common to all three scales, namely "Walks with one hand held" (D4, I2, S4).

One item is given at different levels in two of the scales; I1 describes the progress of a child on hands and feet, "bear-walking" and S3 refers to "crawling on all fours". Of the remaining 23 items, 2 occur in 2 scales and 21 in only one scale.

Only 8 items are included in the D.S.I. and 5 in Illingworth's schedule for this age group. 6 of the 8 D.S.I. items and 4 of Illingworth's 5 items are achieved by between 38% and 73% of the main sample; the remaining items are achieved by most of the children in the sample. There is less variation in achivement levels on these schedules than was apparent at 40 weeks and, at this age, approximately 50% of the sample perform most of the items included. Thus at the 52 week age level, it seems that the performance of this group of Glasgow children is similar to that of the population on which these scales were based, although this was not so for the other age levels studied.

More than 75% of the main sample achieved 14 of the 18 items included in theStycar chart for one year. This chart again seems to provide an accurate descfiption of normal behaviour. However, there are inconsistencies; 3 of the items were achived by less than half the sample, only a quarter being successful in S14.

The performance of the preliminary sample differed from that of the main sample in the same manner as at the 40 week examination and the items where a significant difference ($p < .05$) was detected are marked with an asterisk on Diagram 12. S5 and S6 are concerned with the development of sitting and I1 and S3 with crawling. The children in the preliminary sample tended to show more mature behaviour in these areas of gross motor development than the children of the main sample. S14 describes the ability of the child to understand simple commands; although there is no difference in the small proportion of children in each sample observed by the examiner to be able to obey commands, when mother's history is accepted, the children in the preliminary sample appear to do better on this item.

THE VALUE OF DEVELOPMENTAL SCHEDULES

It has been shown that three of the developmental schedules in common use vary considerably in the items included at 5 age levels during the first year of life. The compilers of the Developmental Screening Inventory and Illingworth state that the items in their schedules are placed at the age level at which roughly 50% of infants or the average child achieves success. Considerably more than 50% of the main sample of Glasgow children achieved most of the items included in these schedules at the 4, 16 and 28 week age levels; at the 40 week age level, the achievements varied markedly from one item to another and at the 52 week age level, approximately 50% of the sample achieved most of the items. Thus it seems that these schedules would be of little value in examining Glasgow children of less than one year of age.

The usefulness of the Developmental Screening Inventory is also reduced by the internal inconsistencies which it contains.

Both schedules have been used as screening tests in the detection of abnormalities of developmental progress. The variable performance of this sample both within and between the different age levels examined indicates that they may be of little use for this purpose. Even if the items were accurately placed at the age levels at which 50% of the sample achieved them, an average value is not an efficient screening tool.

Sheridan's Stycar chart is designed to give an outline of the usual behaviour of a normal child. Despite some variation in achievement at each age level observed, it appears to fulfil this purpose adequately. However, as almost all children achieve most of the items included, it is not sufficiently sensitive to detect other than gross developmental defect.

A comparison of the results obtained on individual items for the preliminary samples indicated that the differences observed in the performance of the samples might by attributable to their different composition by social class and family size. It is reasonable to expect that, with a sufficiently large sample, a well standardised developmental schedule could be compiled. It is unlikely and probably not desirable that separate schedules could be compiled for the different social classes, different family sizes and different racial characteristics which may influence developmental progress. Sheridan (1968) has pointed out that the performance of individual children varies from day to day. Even if the perfect developmental schedule existed, a single examination would be of little use. Sheridan suggests that if a child can perform two-thirds of theitems listed for his age group in each of the four areas of development shown in her booklet, he can be considered to be functioning at the correct level of development for his age. This would appear to be a sensible way of assessing development. Unfortunately, as the items given at each age level in this booklet have not been adequately standardised, its use in this way may allow children with developmental defects to be assessed as within normal limits.

Schedules and scales providing scores or developmental quotients will continue to be needed for survey purposes. For routine work, a revised form of Sheridan's booklet and Stycar chart would be useful. The items included on such a schedule should include those performed usually by, say, 90% of all children at the appropriate age levels. To compile such a chart on a local level would be of little value. Ideally, it should be a national venture, with representative samples of children examined at regular intervals throughout Britain. A child who performed two-thirds of the items included at the appropriate age level on such a schedule could then be described, with reasonable confidence, as being within the normal limits of development for his age group.

DEVELOPMENTAL SCORES

APPLICATION OF THE SCORING SYSTEM

As a previously standardised developmental schedule was not used in this investigation, a scoring system was devised. Five aspects of development were scored: Physical development (Physical Score), the development of the abilities associated with sitting and walking (Sit-Walk Score), hand-eye co-ordination (Hand-Eye Score), the development of fine motor and adaptive skills (Table Top Score), social development (Social Score). A complete list of all the items included in each aspect scored will be found in Appendix 4.

The items included in the assessment of the Hand Eye Score were performed by all the children examined at 40 and at 52 weeks of age and no children were able to perform any of the items of the sit walk and Table Top scores at the 4 week examination. Therefore no Hand Eye scores for the 40 and 52 week examinations or Sit Walk and Table Top scores for the 4 week examinations were calculated. The Social score at 4 weeks and the Sit Walk and Table Top scores at 16 weeks were low and showed little variation as only a few of the items included in these scores were performed by the children at these age levels. The aspects of development scored in each age group are shown in Table XXV.

Table XXV - Scores calculated at each age level.

Score	Examinations				
	4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
Physical	Yes	yes	Yes	-	-
Sit Walk	-	Yes	Yes	Yes	Yes
Hand Eye	Yes	Yes	Yes	-	-
Table Top	-	Yes	Yes	Yes	Yes
Social	Yes	Yes	Yes	Yes	Yes

The scores were calculated from the coded records of the examinations, using an I.B.M. 360/30 computer; the same programmes were used for the calculations at each age level. During the first year of life different patterns of behaviour emerge. Some reflexes and movements, present at birth, disappear or merge into more mature responses; other reflexes and reactions develop as the child matures. Skills and abilities appearing during this period may be fully developed during the first few months of life, for example, the ability to control the head when held in the sitting posture or in ventral suspension, or they may be present in only an immature form at 52 weeks of age, for example, language development. The scores obtained from a developmental or psychological testing procedure are likely to be distributed normally around their mean value only if the tests used have been standardised for age and the test items included are thos appropriate for the age level tested, for example the Stanford-Binet and Wechsler Intelligence Scales. In this investigation, the normal developmental levels of the children seen were not accurately known and so all items used in each score were included whenever that score was calculated. Thus the total scores, particularly at the later examinations, could include items which were achieved by all children seen; each item of this type would increase each child's score by one mark but would not affect the relative position of a child in a ranked order of scores. Although the actual score obtained in an aspect of development is not comparable with the score obtained in the same aspect at a different age level, the rank level of the child at each age level can be compared.

As it is the achievement level of the particular group of children seen which is reflected in the score allotted for each item, each child's individual achievement is assessed with reference to the rest of his group and so scores cannot be compared with those obtained by other groups of children even when examined at the same age levels. And, although the child's relative position in his group can be compared for the different aspects of development studied, the numerical scores cannot be compared directly. The scores were used as a research tool and were not intended to provide any form of developmental quotient.

The method used for the calculation of the score to be given to each item was based on the coding system used on Forms 3 and 4. In this, several items might be required to record the level of achievement shown on one skill or attribute. For example, on Form 3, the child's attitude to nursery games is recorded by three coded items: "Appreciates nursery games" (column 15), "Plays nursery games after demonstration" (column 16) and "Plays nursery games if asked" (column 17). These items are arranged in order of developmental progress and the child can be recorded as performing only one of these items. Each column will contain a code, indicating the child's level of performance '0' shows that the child has not reached the stage shown, '1' that he has been observed to reach it, '2' that mother reports that he has reached this stage and '-' that he has passed it and moved on to a higher level of development. Thus if a child has reached the stage where he will play nursery games, but only does so after they have been demonstrated to him, his records would contain the code '-' in column 15, '1' in column 16 and '0' in column 17. If the achievement had not been observed by the examiner but was reported by the mother, the column corresponding to the reported level of achievement would be punched with the code '2'. The items included in the Physical, Sit Walk and Table Top scores were recorded as achieved only when this behaviour was observed by the examiner; it was necessary to include items whose achievement was reported only by the mother in the calculation of the scores for hand eye co-ordination and social development.

For scoring, it was necessary to convert the achievements recorded on Form 2 to the coding system used on Forms 3 and 4. On Form 2, only one column had been used to record each skill or attribute and the developmental level achieved in this skill was shown by the numerical code allotted. For example, the child's posture when held in the sitting position had six possible codes:

Code	Level of achievement
0	No head control; back curved
1	Head erect momentarily.
2	Head held steady, set forward; head wobble when swayed.
3	Head held steady, erect; thoracic spine straight.
4	Back straight; no head wobble when swayed.
-	Higher level of development.

When converted into the type of coding used in Form 3 and 4, this item was recorded in four columns (a, b, c and d). The 4 column code for each possible level of achievement when held in sitting is shown in Table XXVI. The other items from Form 2, used in the compilation of the scores were recorded in a similar manner.

TABLE XXVI - Conversion of coding system for scoring.

Code on Form 2	New Code			
	Col. a	Col. b	Col. c	Col. d
0	0	0	0	0
1	1	0	0	0
2	-	1	0	0
3	-	-	1	0
4	-	-	-	1
-	-	-	-	-

The scoring system was described earlier (page 61) and is summarised here.

Code 0, score = 0 plus the proportion of children with code 0 on this item.

Code 1, score = midway between the scores for codes 0 and - on this item.

Code 2, score = three quarters of the score for code 1 on this item.

Code -, score = 2 minus the proportion of children with code - on this item.

The five sets of scores will be discussed separately. Tables showing the values and distribution of the scores obtained are included in Appendix 5.

GROSS MOTOR DEVELOPMENT

Compilers of developmental schedules frequently divide the achievements observed into four or five areas of developmental progress. Some items are constant in their placement but there is considerable variability and overlap between the schedules on the placement of most items. The achievements examined in this study were placed, at first, in three groups: gross motor development, fine motor and adaptive development and social development.

A score, the Total Physical score, was calculated from the appropriate observations of this investigation. There appears to be least disagreement amongst authors of developmental schedules on the area of gross motor development and the Total Physical score was compiled from items similar to those included in the area of Gross Motor Development of the Developmental Screening Inventory and the Posture and Large Movement division of Sheridan's charts. The items whose individual scores were summed to give the total Physical score are listed in Appendix 4 and are taken from Forms 2 and 3 (Appendix 1).

The items from Form 2 are those describing the development of postural control and the reflexes associated with mobility and large movements. These were the observations recording the child's posture when held in sitting, placed in the supine position, placed prone and when held in ventral and in vertical suspension. The reflexes whose presence or absence was scored, were the plantar grasp reflex, positive supporting and stepping reactions, the placing response, tonic neck reflex, neck righting reflex, the Moro response, and the trunk elevating and parachute responses.

With one exception, all the items on the second part of Form 3 which describe the skills associated with the development of sitting and walking, were included in the Total Physical score. The one item omitted was "Sits forward in the pram with reins"; this was considered to be of no value as very few mothers used reins in the pram until the child was able to sit alone well.

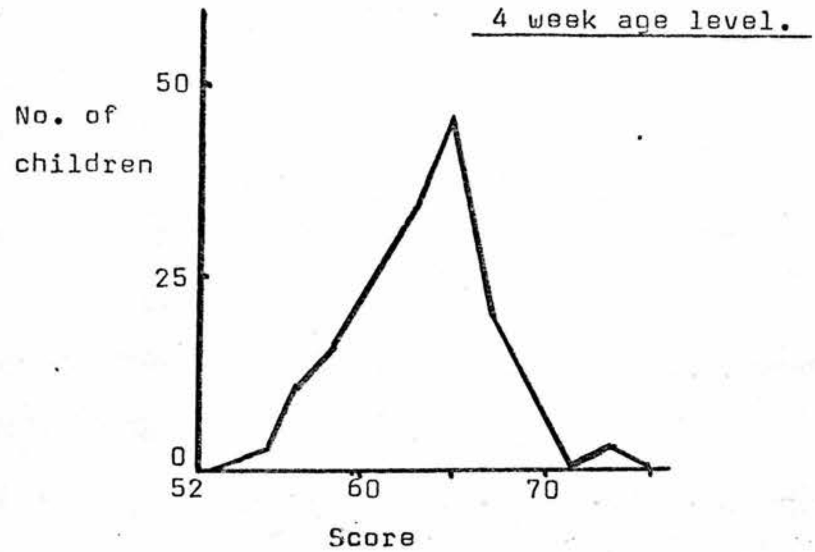
TABLE XXVII - Range and Mean values of Total Physical Scores.

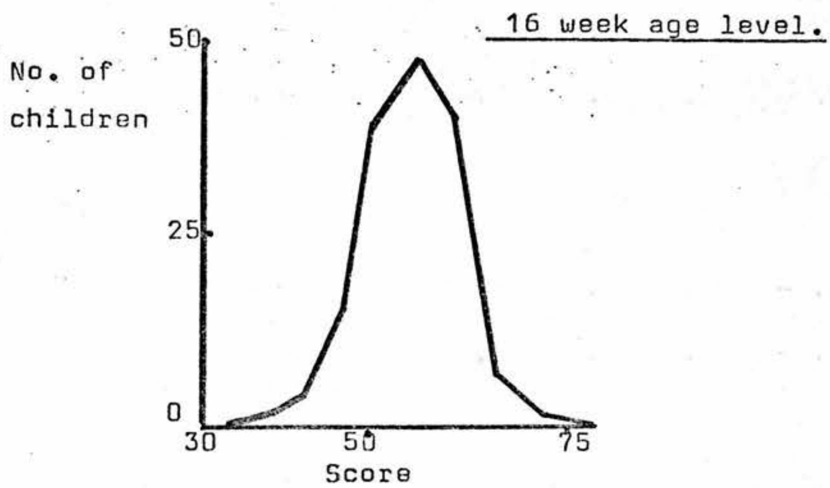
Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample							
4 weeks	54.0-73.7	65	63.8	63.4	3.47	-0.35	168
16 weeks	35.1-70.8	57	57.9	56.8	5.83	-0.57	147
28 weeks	73.1-105.9	87	90.4	89.4	7.23	-0.41	154
40 weeks	74.2-131.3	123	114.1	113.6	10.45	-0.14	153
52 weeks	84.8-131.7	115	114.7	114.2	8.72	-0.17	143
Preliminary Sample							
40 weeks	84.3-127,1	119	114.9	112.4	8.85	-0.84	97
52 weeks	88.8-127.1	118	114.9	113.7	8.15	-0.44	72

Table XXVII lists the range of each set of Total Physical scores with the mode, median, mean and standard deviation (S.D.) and Pearson's coefficient of skewness (Skew). The numerical values of the scores are of less importance than their distribution; the frequency polygons of the scores (Diagrams 13 and 14) show that, the distributions are similar to the normal distribution but in each case there is a tendency towards negative skewing.

The mean value of any group of observations may be affected disproportionately by a few values at the extremes of the range;

DIAGRAM 13. Distribution of the Total Physical scores of the main sample at the 4, 16 and 28 week age levels.





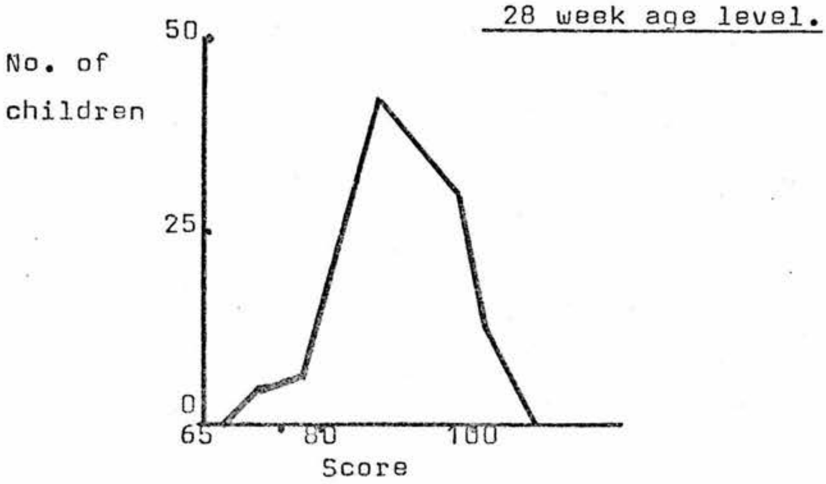
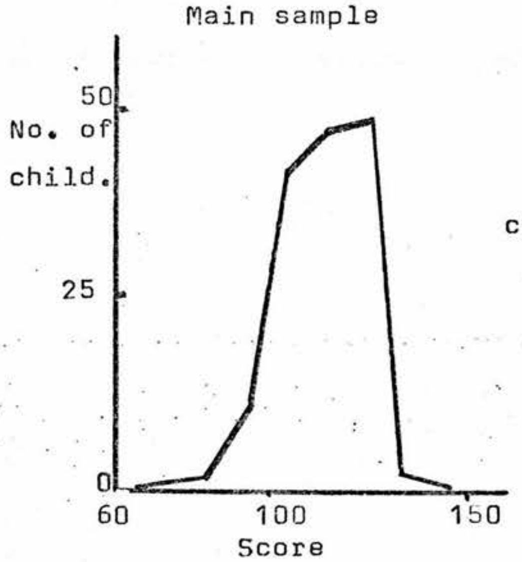


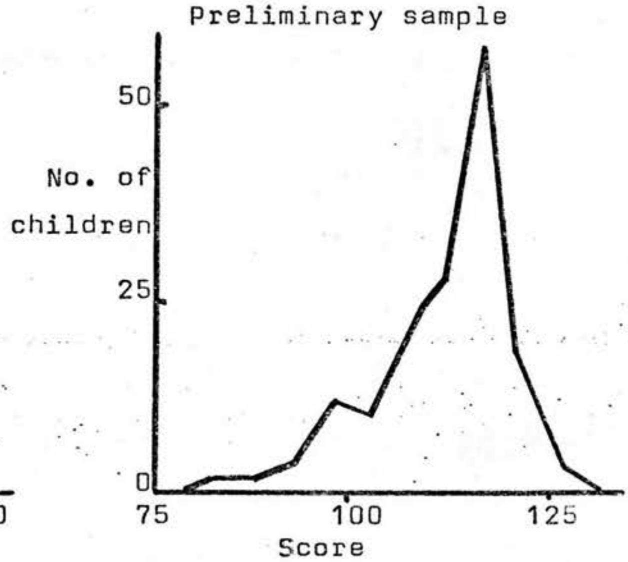
DIAGRAM 14. Distribution of the Total Physical scores of the main and preliminary samples at the 40 and 52 week age levels.

40 week age level.

Main sample

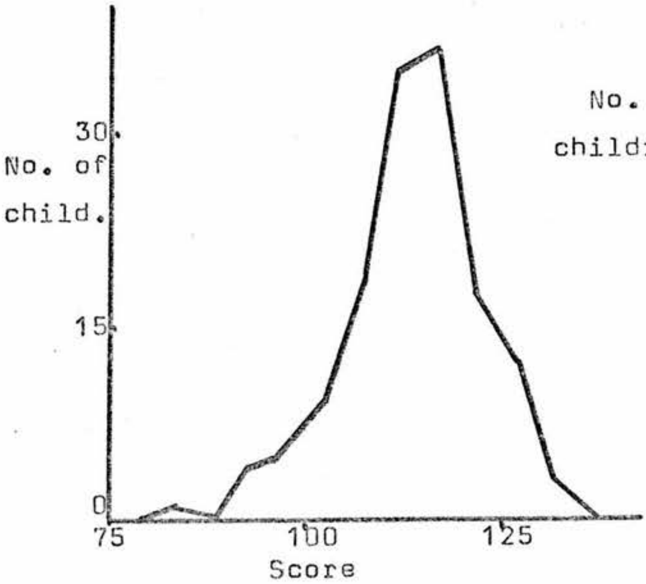


Preliminary sample

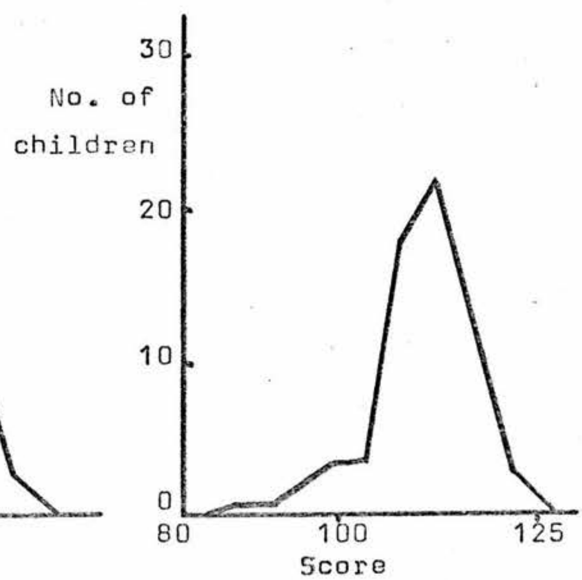


52 week age level.

Main sample



Preliminary sample



a few children with a very high or very low score would alter the mean value and increase the standard deviation of the mean. The median value of the range is at the mid-point of the range and is unaffected by these extreme values and the modal value, which is that which appears most frequently, the "fashionable" value, is also unaffected by the range. In a skewed distribution, the modal value is to one side of the mean and median values; in the normal distribution, the three measures of central tendency, mean, mode and median, all coincide. Pearson's co-efficient of skewness is a measure of the extent to which the distribution is skewed and incorporates the mean mode and standard deviation.

$$\text{Pearson's co-efficient of skewness} = \frac{\text{Mean} - \text{Mode}}{\text{Standard Deviation}}$$

However, if the values are scattered over a wide range, relatively few values may appear more than once and then the modal value must be obtained from a grouped frequency distribution. The mode may vary with the class interval chosen for the grouped distribution and is, therefore, arbitrary and not suitable for further mathematical treatment. A modified form of Pearson's co-efficient has been devised; this incorporates the mean, median and standard deviation and has been used in this investigation.

$$\text{Pearson's co-efficient of skewness} = \frac{3(\text{Mean} - \text{Median})}{\text{Standard Deviation}}$$

All the groups of Total Physical scores examined were negatively skewed and the values of the co-efficients of skewness varied from -0.14 to -0.84. With such small samples, these values may be compatible with the treatment of the distributions as normal for practical purposes. A characteristic of a normal distribution is that 68% of the values lie within the limits of one standard deviation on either side of the mean. The observed number of scores falling within one standard deviation of the mean was not significantly different from the expected number in any of the groups of Total Physical scores (Table XXVIII).

TABLE XXVIII - Observed and expected values within one standard deviation of the mean for Total Physical scores.

Examination	Expected No.	Observed No.	Difference
Main Sample			
4 weeks	114	118	+4
16 weeks	100	105	+5
28 weeks	105	105	0
40 weeks	105	98	-7
52 weeks	96	96	0
Preliminary Sample			
40 weeks	66	68	+2
52 weeks	48	50	+2

The preliminary and main samples were selected by different sampling procedures and, as the scores for each child were compiled from items where the level of the score depended upon the group achievements, it had been thought that the actual numerical scores obtained by the children in each sample group would not be comparable and might differ considerably. However, it was noted that the means and standard deviations of the Total Physical scores at 40 and 52 weeks were similar for both samples. The range of scores was greater in the main sample but, as more children were included inthe main sample, this was to be expected. The Standard Errors of the differences between the means of the main and preliminary samples at 40 and 52 weeks were calculated and found to be 1.23 and 1.19 respectively. In both cases, the actual differences between the means, 1.2 and 0.5, were less than these values. Unless the observed difference between the two means is at least twice the value of the standard error between these means, it might easily have arisen by chance. From the statistical evidence, it would appear that the two samples could be from the same population. Thus, although it has not been attempted here, it might be possible to compare the scores, obtained in the manner described, from several larger groups of children.

During the survey examinations, it was observed that, in each age group, many children appeared to have reached the same level of physical development, assessed on the presence of reflexes and postural control. Despite this, the achievements of the children in actually sitting, walking and crawling varied considerably. In the folklore of child development, there are constantly recurring tales of children who "just sat" at an age when most children are trying to walk; one day this apparently slow child "just stands up and walks - perfectly". This tale is repeated so frequently that it is likely to be based on real events. It is feasible that a child becomes physically capable of sitting alone, walking or crawling at a variable point in time before he actually exhibits these skills.

To investigate this feature, the Total Physical score was broken down into two parts, a Physical and a Sit Walk score. The Physical score included all the items from Form 2 describing the development of reflexes and postural control which had formed part of the Total Physical score; the Sit Walk score included the items on sitting and walking achievements from Form 3 and the items from

Form 2 which described the development of mobility, by means other than walking, that is shuffling or hitching and crawling. The Physical score was composed of the items reflecting the physiological development of gross motor abilities and the Sit Walk score represented the extension of these skills, which might be associated with factors other than physical maturation alone.

No sit Walk score was calculated for the 4 week examination as none of the items were performed by any of these children. At 16 weeks, a few children were beginning to sit with support and to squirm around on their abdomens, in an attempt to move about the floor. The range of the Sit Walk scores at 16 weeks was from 1.4 to 4.5 and only 6 different scores were obtained within these limits. This score is of no practical value and is not included in Table XXX. The range, mode, median, mean and standard deviation, and Pearson's co-efficient of skewness for the Physical and Sit Walk scores from 16 to 52 weeks are shown in Tables XXIX and XXX.

TABLE XXIX - Range and mean values of Physical scores.

Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample							
16 weeks	33.7-66.3	58	55.2	54.0	5.48	-0.66	147
28 weeks	35.4-57.8	51	49.8	49.2	4.17	-0.43	154
40 weeks	44.9-73.7	73	70.7	69.8	4.17	-0.65	153
52 weeks	62.2-73.3	70	71.1	70.0	1.63	-2.02	143
Preliminary Sample							
40 weeks	58.1-72.8	71	69.9	68.6	3.00	-1.30	97
52 weeks	62.9-72.2	70	69.8	70.4	1.51	-1.19	72

DIAGRAM 15. Distribution of the Physical and Sit Walk scores of the main sample at the 16 and 28 week age levels.

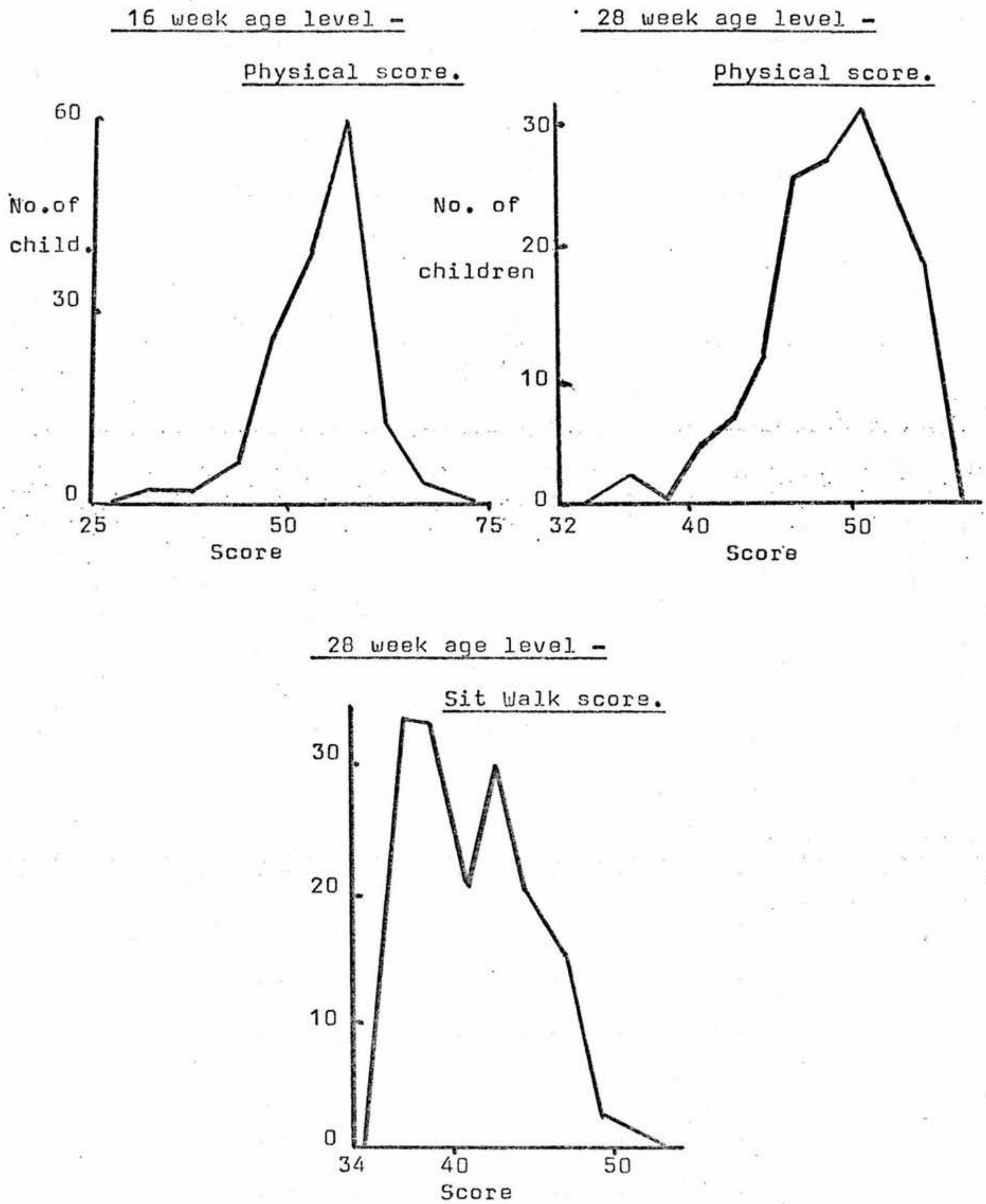
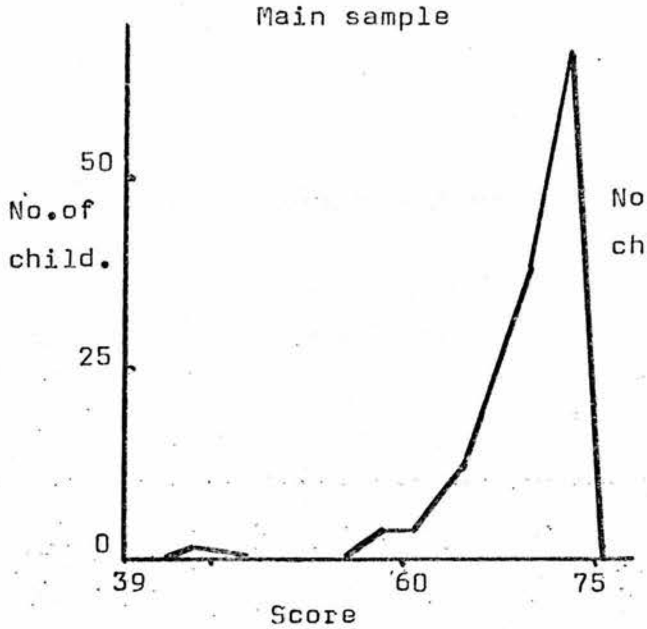
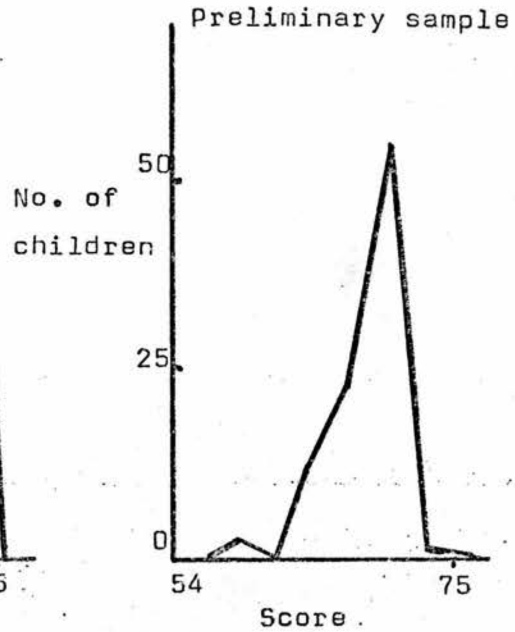


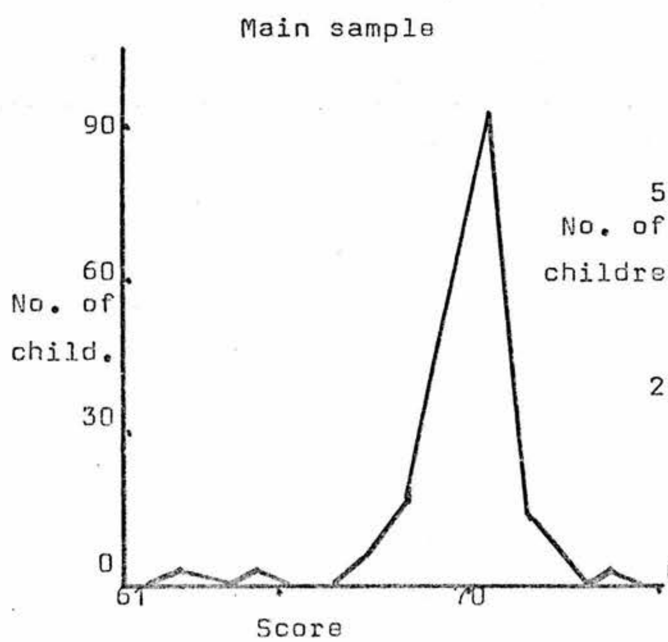
DIAGRAM 16. Distribution of the Physical scores of the main and preliminary samples at the 40 and 52 week age levels.

40 week age level.





52 week age level.



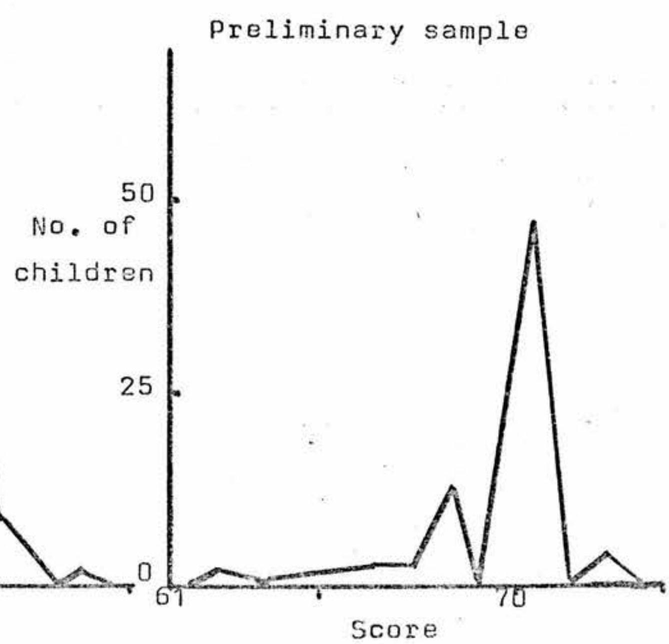


TABLE XXX - Range and mean values of Sit Walk scores

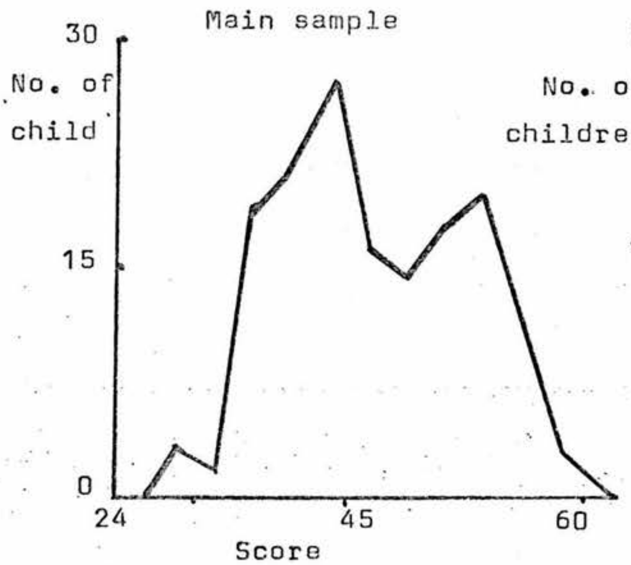
Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample							
28 weeks	36.6-50.0	37	40.8	41.3	3.40	+0.44	154
40 weeks	27.8-58.2	41	43.1	43.8	6.98	+0.30	153
52 weeks	22.5-59.8	41	44.7	44.2	7.45	-0.20	143
Preliminary Sample							
40 weeks	26.2-55.7	48	44.9	43.6	6.26	-0.62	97
52 weeks	25.2-54.8	40	44.9	43.8	7.03	-0.47	72

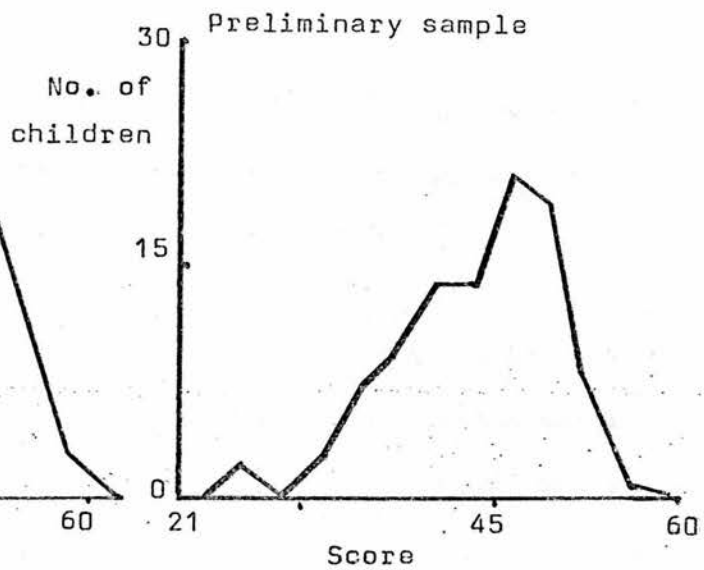
The distribution of the Physical scores is negatively skewed at each age level (Diagrams 15 and 16); the distributions of the 40 and 52 week Physical scores cannot be considered to approximate to the normal distribution as, in each case, more than 80% of the scores are within one standard deviation from the mean. It would appear that, at the 40 and 52 week age levels, most of the children of both the samples studied have reached the same level of physical maturity; the negative skewness and large size of the co-efficient of skewness (-2.02 at 52 weeks) is produced by the abnormally low scores of a small number of children who are relatively immature in their physical development.

In contrast, the observed number of children whose score falls within one standard deviation from the mean for the Sit Walk scores, does not differ significantly from the expected level of 68% at any of the age levels for which this score was calculated. The frequency polygon of the scores (Diagrams 15 and 17) indicate that the distribution of the scores of the main sample at 28 and 40 weeks is bimodal;

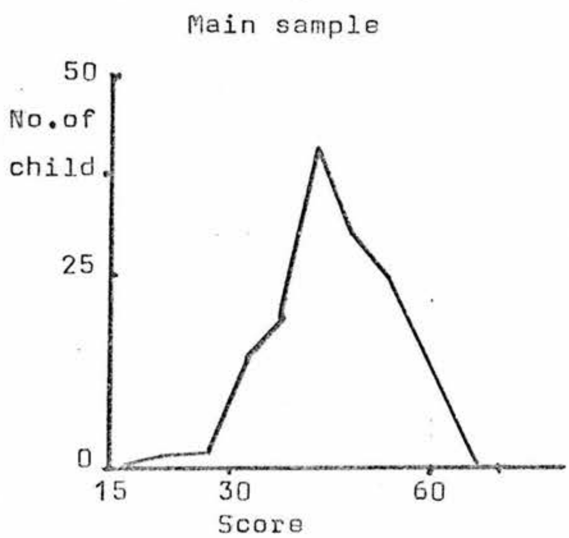
DIAGRAM 17. Distribution of the Sit Walk scores of the main and preliminary samples at the 40 and 52 week age levels.

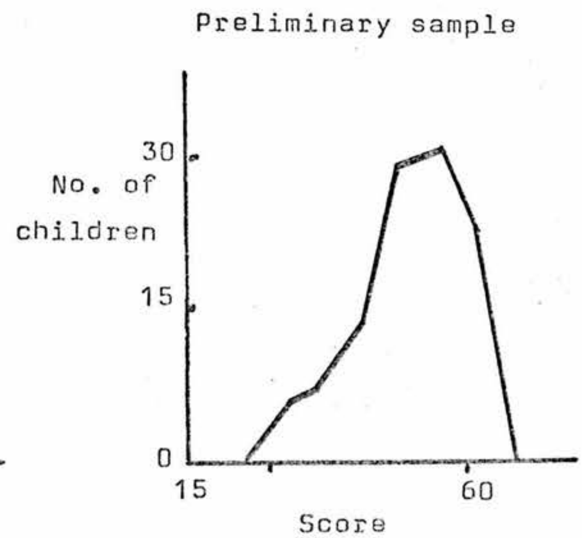
40 week age level.





52 week age level.





a suggestion of a similar trend is apparent in the polygon of the scores for the preliminary sample at 40 weeks. The direction of the skew is positive for the 28 and 40 week main sample scores and this corresponds with the position of the larger peak of the bimodal distribution. A smaller number of children were seen in the preliminary sample, 97 at 40 weeks and 72 at 52 weeks. With such small samples, the unimodal distribution and the negative skew of the Sit Walk scores of the preliminary sample could be compatible with the different distribution shown by the scores of the main sample at this age level; the standard error of the difference between the means of the two samples (0.86) was greater than the actual difference between the means (0.2) and so despite the apparent differences, both samples could have been drawn from the same population. The standard error of the difference between the means of the two samples at the 52 week age level (1.02) also exceeded the actual difference between the means (0.4) and the distributions in both samples was unimodal and negatively skewed. There is no obvious explanation for the bimodal distribution of the earlier Sit Walk scores but it is possible that the attributes examined, the development of the ability to sit, walk and move around by crawling or shuffling are not all aspects of one ability but, to some extent, crawling or shuffling around develops independently of the ability to walk. Thus at 28 and 40 weeks, the scores obtained reflect these two distinct attributes which are obscured at 52 weeks as both abilities are then present in a fairly mature form.

As has been shown above, the standard error of the difference between the means of the main and preliminary samples for the Sit Walk scores at both 40 and 52 weeks was greater than the observed difference between the means, indicating that both samples may have been drawn from the same population. This was also the case for the Total Physical scores at both 40 and 52 weeks and for the Physical score at 52 weeks where the standard error of the difference between the means was 0.22 and the observed difference 0.2. At 40 weeks, the observed difference between the means for the Physical scores of the two samples (1.2) was more than twice the standard error of the difference between the means (0.45); therefore, it is unlikely that these two samples came from a similar population. This finding emphasises that any comparison of the scores obtained in the manner described, from two or more different groups should not be directly compared unless the relationship between them has first been evaluated fully.

The Physical and Sit Walk scores at 28 weeks are distributed around their means in a reasonably symmetrical manner; The scatterdiagram in Diagram 18 illustrates the relationship between the grouped distribution of these scores. No child with a Physical score of less than 45 has achieved a Sit Walk score exceeding 45 and all 3 children with a Sit Walk score of over 55 gained a Physical score of at least 45. The 129 children (84%) whose Physical score was between 45 and 55 had Sit Walk scores distributed throughout the range of scores. The correlation co-efficient (r) was statistically significant for this relationship, (r = 0.62, p .01). Thus at 28 weeks, the skills of sitting, walking and mobility were related to the physiological maturity of the child, as assessed by the Physical score. However, the children with the same Physical score varied considerably in their sitting, walking and mobility achievements.

Diagrams 19 and 20 show the relationship of the Physical and

DIAGRAM 18. Scatter diagram of the grouped distributions of the Physical and Sit Walk scores of the main sample at the 28 week age level.

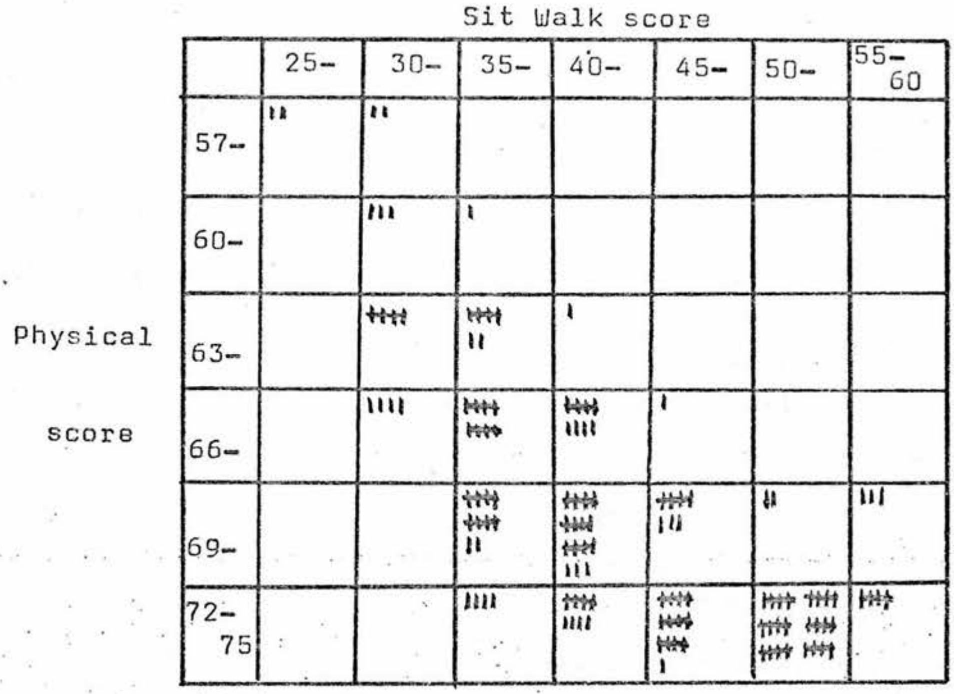
Sit Walk score

Physical score	36 –	39 –	42 –	45 –	48 – 51
30 –	|				
35 –	|||				
40 –	卌 卌 |||	|||	||		
45 –	卌 卌 卌 卌 卌	卌 卌 卌 |	卌 卌 卌	|||	
50 –	卌 |||	卌 卌 卌 ||	卌 卌 卌 卌 卌 ||||	卌 卌 ||||	||
55 – 60				||	|

Sit Walk scores for both samples at the 40 and 52 week age levels. As the Physical scores for each of these were not normally distributed, none of the scattergrams show a straight line relationship and so correlation co-efficients here would be of little use. Both sets of scattergrams do show similar patterns; high Sit Walk scores do not occur if the Physical score is low. But at the same level of physical maturity, that is with a similar Physical score, there is a considerable variation in the level of achievement of the skills associated with sitting, walking and mobility, as measured by the Sit Walk scores obtained. The influence of obstetric and environmental factors on these scores will be discussed later.

DIAGRAM 19. Scatter diagrams of the grouped distributions of the Physical and Sit Walk scores of the main and preliminary samples at the 40 week age level.

Main sample.



One child, with a Sit Walk score of 27.8, had a Physical score of 44.9 and was outside the limits of the diagram.

Preliminary sample.

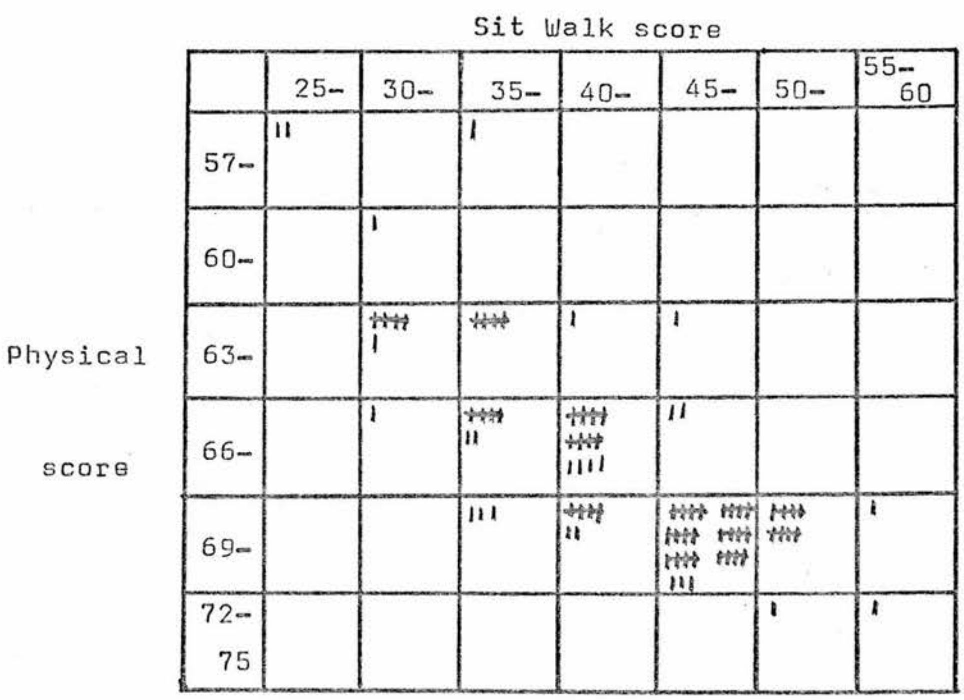


DIAGRAM 20. Scatter diagrams of the grouped distributions of the Physical and Sit Walk scores of the main and preliminary samples at the 52 week age level.

Main sample.

Sit Walk score

Physical score	20-	25-	30-	35-	40-	45-	50-	55-60
62-	|	|						
64-		|	||					
66-			卌		|			
68-	|		||	卌 卌	卌 ||	|	||	
70-			||||	卌 ||||	卌 卌 卌 卌 卌 卌 |||	卌 卌 卌 卌 卌 卌	卌 卌 卌 卌	卌 卌 |
72-74								||

Preliminary sample.

Sit Walk score

Physical score	20-	25-	30-	35-	40-	45-	50-	55-60
62-		|						
64-		|						
66-		||	|		|			
68-			||	||	||||	卌		
70-			||	卌 ||	卌 卌 ||||	卌 卌 卌	卌 卌 |	
72-74							||||	

FINE MOTOR DEVELOPMENT

The fine motor skills included in the score for this area of achievement in the study are mainly those which appear in the areas of Fine Motor and Adaptive Development in the Developmental Screening Inventory. Similar items are found in the divisions of Vision and Fine Movements and of Social Behaviour and Play of Sheridan's charts.

The basic skill on which all other achievements in this developmental area depend, appears to be hand-eye co-ordination and the score is, therefore, referred to as the Total Hand Eye score; it included items from Form 2 and Form 4 (Appendix 4). The items from Form 2 were those which demonstrated the development of hand-eye co-ordination; the progress of the palmar grasp reflex and the development of voluntary grasp, the normal position of the hands in relaxation and the voluntary movements of the hands, pulling at clothes, together in the midline, grasping at the toes and pulling the feet to the mouth when the child was in the supine position, and the presence of hand regard. It was not possible to examine vision fully but the pupillary reaction, blink response, ability to follow a lighted torch and the manner of regard and extent to which a child could follow a ring dangled above his head while he was supine, were observed.

The 'Table Top' tests recorded on Form 4 correspond to the items in the Adaptive area of Gesell's Developmental Sbhedules (1947); various test items were presented to the child while he was seated, alone or supported, at a table top and his responses observed. The test objects used varied with the developmental level of the child examined but included, when appropriate, cubes, both alone and with a cup, a pellet, alone and with a small bottle, a handbell, a ring with an attached string, a mirror, picture book, crayon and paper and a simple formboard. At the completion of this section of the examination, the table was removed and the child's response to ball play noted. A few of the items included in Form 4 appeared to be of little value in the assessment. The "index finger approach" to small objects, described as typical behaviour at the 40 week age level by most authors, seemed atypical in this sample. Two setsof observations, the hitting and pushing of the cup with the cubes and the approach first to bottle or pellet when both were presented, appeared to show inconsistent responses which had no relationship with the general level of development as shown by the performance on the other test items. When the simple formboard and the round block were presented, it was difficult to assess whether the child had "looked selectively at the round hole" or not; usually, if the child realised that the block should be placed in the hole, he tried to do so and, if he did not realise this, he either ignored the board or hit and pushed at it. The children who "kissed" their image in a mirror were frequently those for whom such an action was a bedtime ritual. The Total Hand Eye score was calculated from the scores for the individual items on Form 4, with the five items described above omitted.

The range of the Total Hand Eye scores obtained at the examinations of both groups of children are shown in Table XXXI, with the modal and median values, the means and standard deviations, and Pearson's co-efficients of skewness.

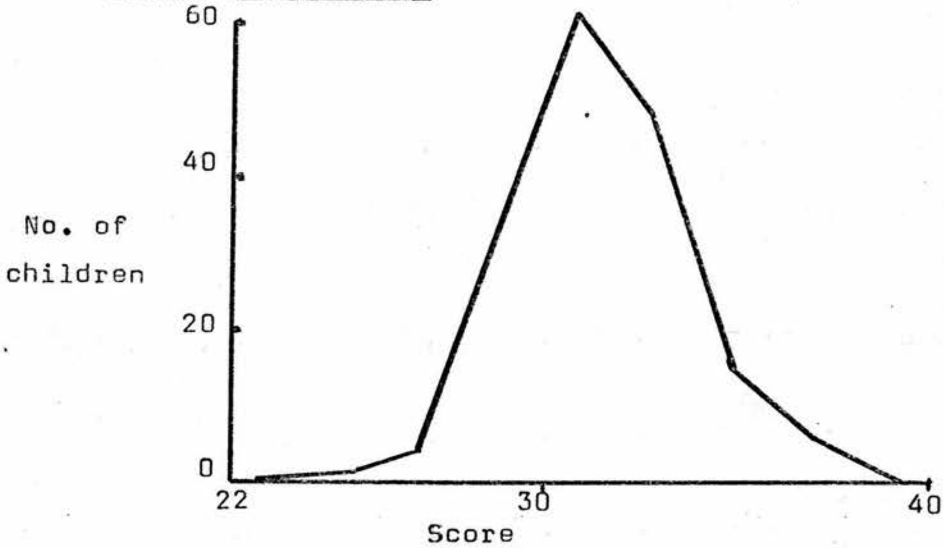
TABLE XXXI - Range and Mean Values of Total Hand Eye Scores.

Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample							
4 weeks	24.4-37.0	31	31.7	31.7	2.14	0.0	168
16 weeks	24.3 52.7	46	45.5	45.2	6.75	-0.13	147
28 weeks	89.8-124.0	116	113.1	112.3	6.62	-0.36	154
40 weeks	51.7-108.0	88	84.1	83.3	9.54	-0.25	153
52 weeks	47.5-101.0	85	85.5	84.5	7.52	-0.40	141
Preliminary Sample							
40 weeks	51.8-99.4	85	84.1	83.0	8.11	-0.59	97
52 weeks	62.6-92.6	83	84.5	84.0	6.46	-0.23	70

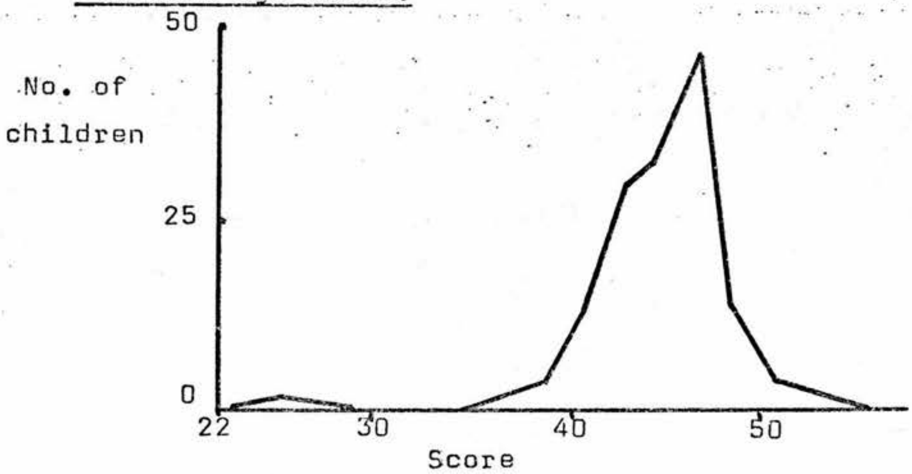
At the 4 week age level, the Total Hand Eye score is distributed in a reasonably normal manner around the mean value and the co-efficient of skewness is 0. At the other age levels, the distributions of the scores are all negatively skewed, and, except at the 16 week age level, these distributions are reasonably normal with the proportion of scores occurring within one standard deviation of the mean not differing.significantly from the expected 68%. The range of scores for 146 of the 147 children seen at 16 weeks, extends from 34.7 to 52.7; one child has the much lower score of 24.3. However, even when this child is excluded, the distribution of the scores is negatively skewed and 86% (126) of the scores occur within one standard deviation

DIAGRAM 21. Distribution of the Total Hand Eye scores of the main sample at the 4, 16 and 28 week age levels.

4 week age level.



16 week age level.



28 week age level.

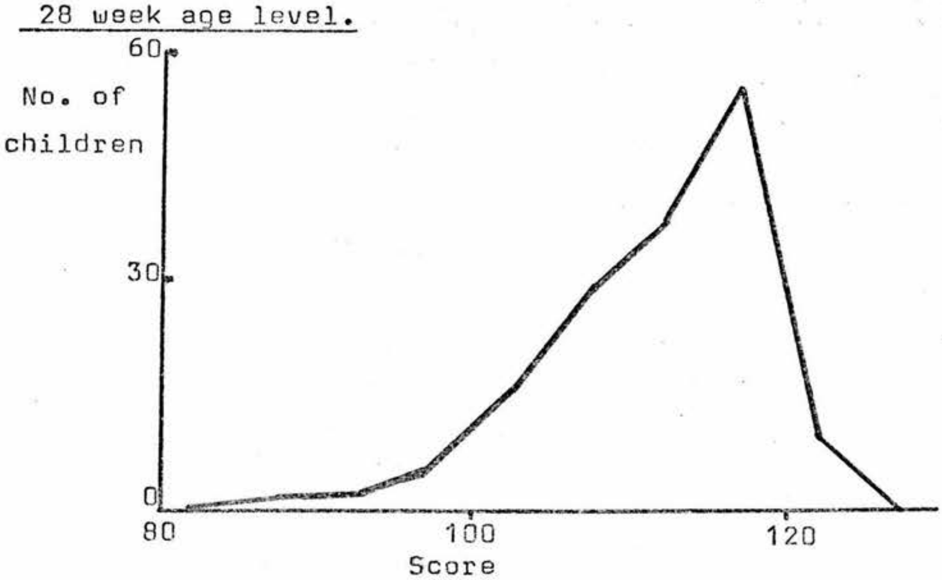
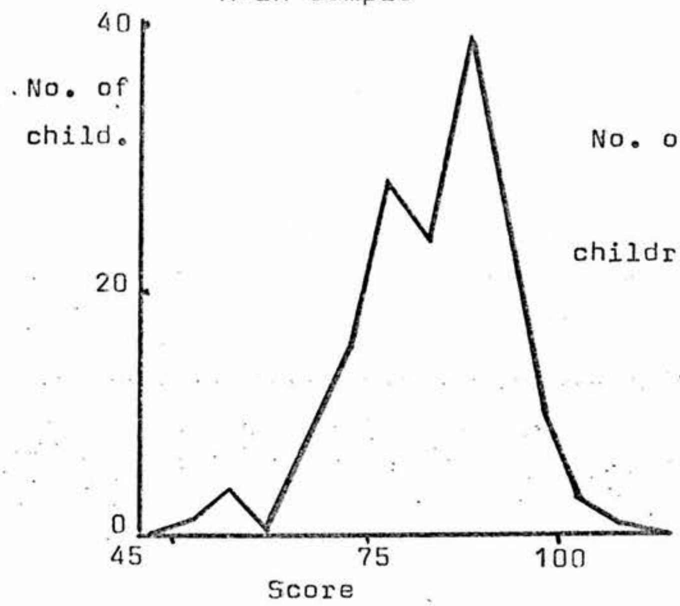


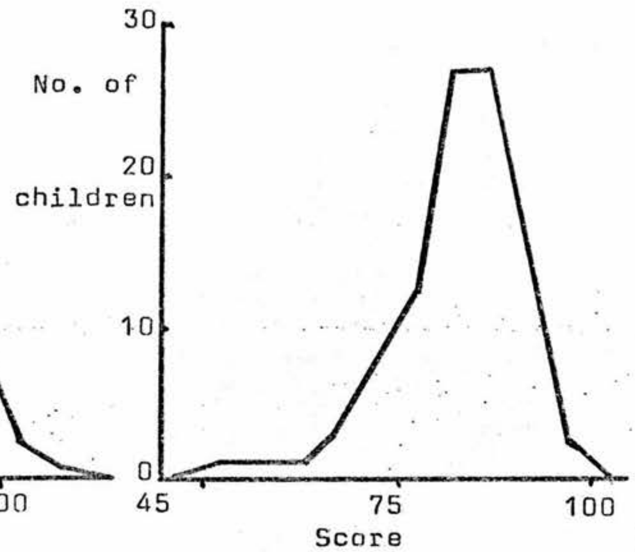
DIAGRAM 22. Distribution of the Total Hand Eye scores of the main and preliminary samples at the 40 and 52 week age levels.

40 week age level.

Main sample

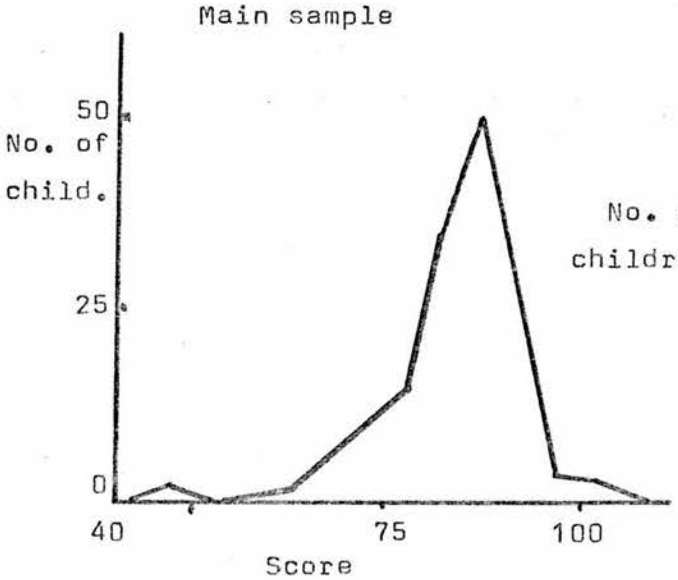


Preliminary sample

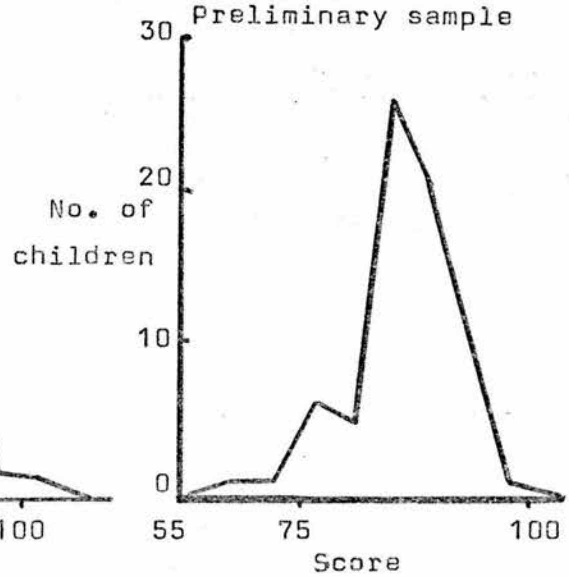


52 week age level.

Main sample



Preliminary sample



from the mean; this is significantly above the expected 68% (100) score ($p < .01$).

The standard error of the differences between the means for the Total Hand Eye scores of the main and preliminary samples at the 40 and 52 week examinations were, in both cases, greater than the actual differences found between the mean values (standard error of the difference between the means 1.13 and 0.99, respectively, and actual difference between the means 0.3 and 0.5). It is possible, therefore, that the two samples were drawn from populations with similar characteristics; this was also noted for the Total Physical scores of the two samples.

The development of manipulative skills such as those demonstrated in the "Table Top" tests of Form 4 cannot take place until the basic achievements of hand eye co-ordination, recorded on Form 2, have been mastered. These items from Form 2 correspond almost exactly to the items included in the Fine Motor and Adaptive areas of the Developmental Screening Inventory, up to and including the 16 week age level; it was observed that most of the children examined performed almost all of these items when seen at 28 weeks. The Fine Motor and Adaptive areas of the Developmental Screening Inventory, from the 20 week age level onwards, contained items very similar to those of Form 4; these test items are similar to the tests used in assessing the non-verbal intelligence levels of older children and it was observed that the performance levels achieved by the children on these items were spread over a wide range at each examination. It is possible that Fine Motor development, like Gross Motor development, may be divided into two parts; physiological and adaptive.

To examine this hypothesis, the Total Hand Eye score was separated into a Hand Eye score and a Table Top score. The Hand Eye score was calculated from the items of Form 2 which reflected the development of hand-eye co-ordination; the Table Top score contained the items on Form 4, with the exceptions already listed. No items from this Table Top score were performed by the children seen at the four week age level and, by the 40 week examination, all the children performed all the items of the Hand Eye score. Therefore, separate Hand Eye and Table Top scores were calculated at the 16 and 28 week age levels only; Tables XXXII and XXXIII show the range, median and modal values, means and standard deviations and Pearson's coefficient of skewness for these scores.

TABLE XXXII - Range and mean values of Hand Eye scores.

Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample 16 weeks	15.1-31.2	29	29.3	29.5	2.03	-0.89	147
28 weeks	22.5-28.2	27	27.8	27.6	0.70	-0.86	155

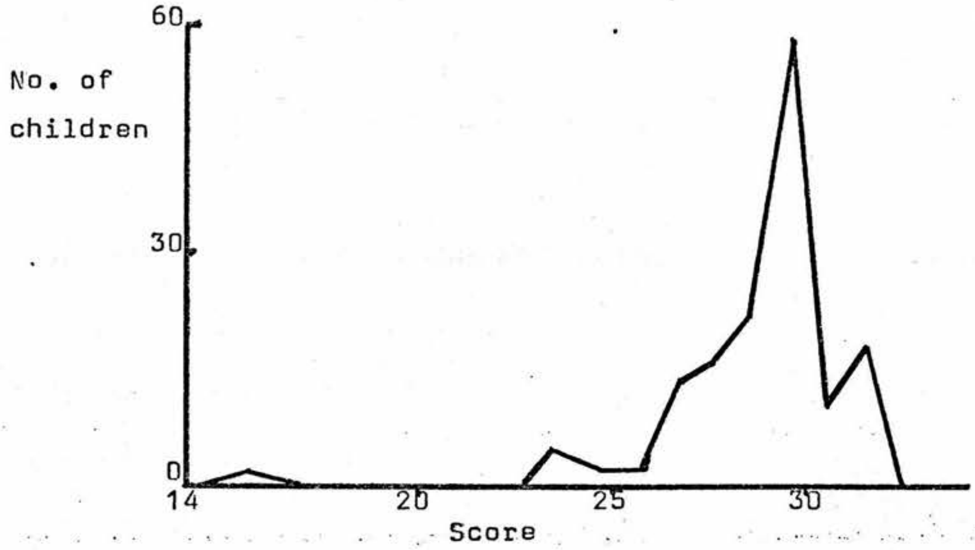
TABLE XXXIII - Range and mean values of Table Top scores.

Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample 16 weeks	9.2-21.7	17	16.7	16.6	1.80	-0.12	147
28 weeks	64.2-96.1	88	85.4	84.6	6.24	-0.38	155

The distributions of the Hand Eye scores at 16 and 28 weeks are negatively skewed and do not correspond to a normal distribution curve (Diagram 23). The proportion of the scores occurring within one standard deviation of the mean is, in each case, greater than the 68% expected in a normal distribution (75% and 92% respectively)

DIAGRAM 23. Distribution of the Hand Eye scores of the main sample at the 16 and 28 week age levels.

16 week age level.



28 week age level.

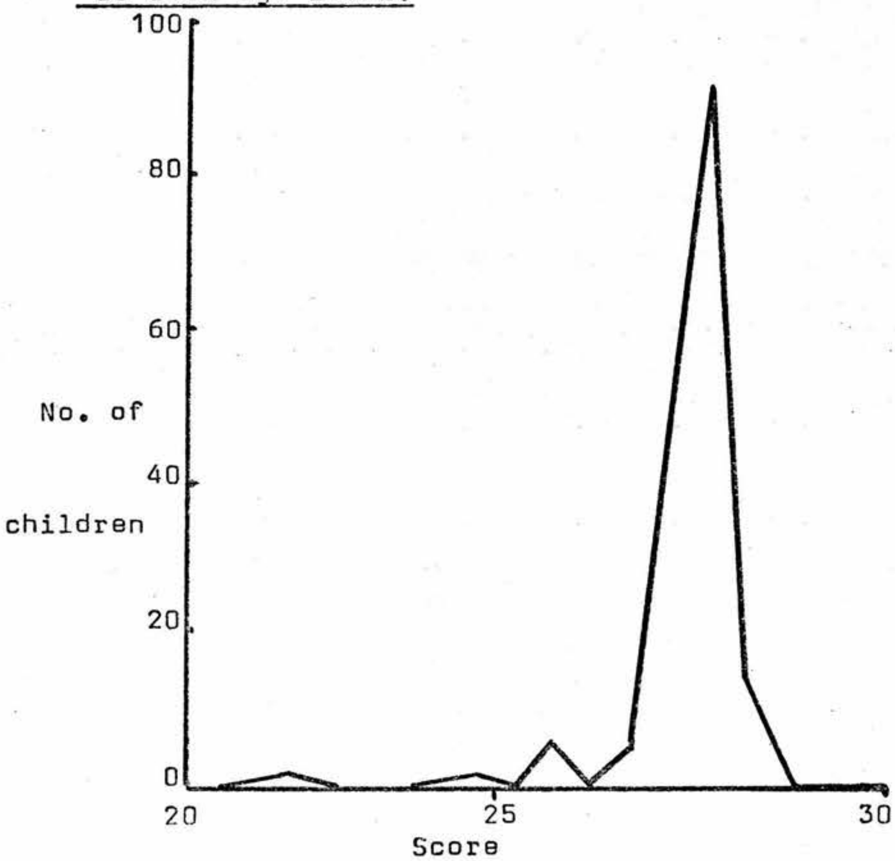
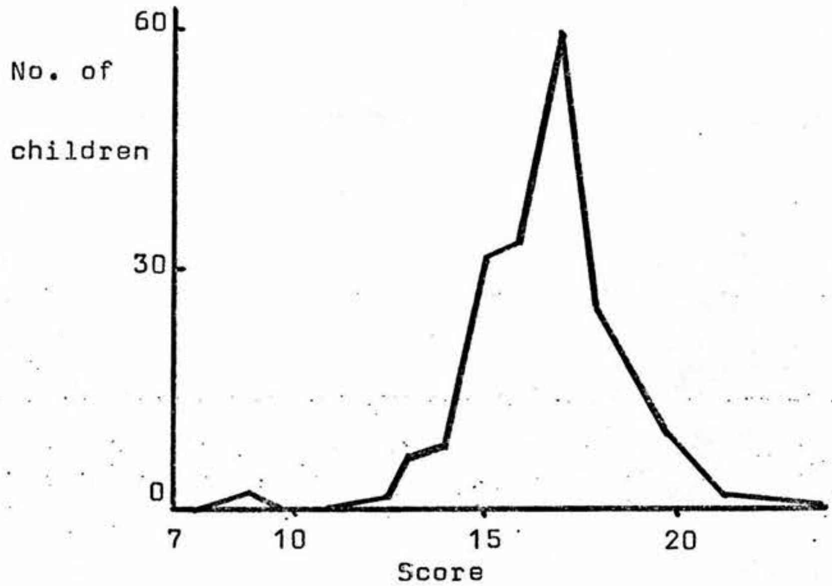
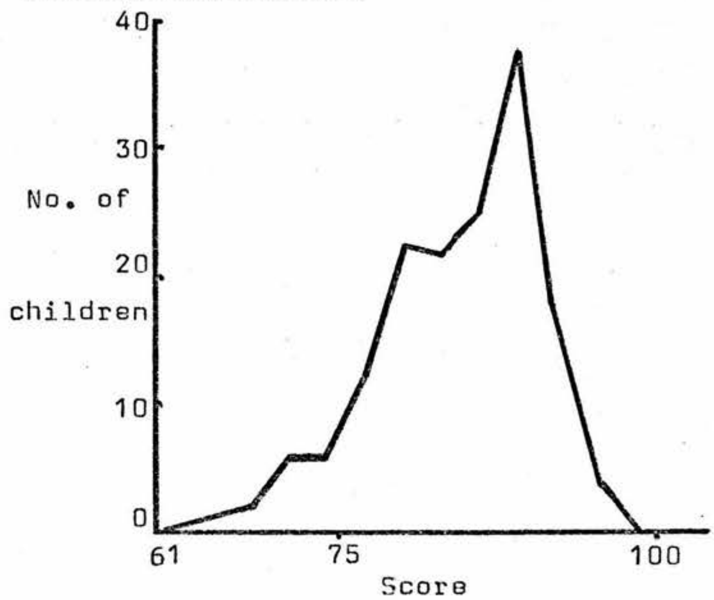


DIAGRAM 24. Distribution of the Table Top scores of the main samples at the 16 and 28 week age levels.

16 week age level.



28 week age level.



and the differences observed are statistically significant ($p < .05$ and $< .01$). The Table Top scores at the 16 and 28 week age levels are also negatively skewed but here the curves produced are within the limits expected in a normal distribution (Diagram 24).

At 16 weeks, the Table Top score was calculated from the children's performance of a comparatively small number of items. The normal distribution obtained on this score was, therefore, insufficient to counteract the greatly skewed distribution of the Hand Eye score at this age level so that the Total Hand Eye score was not distributed normally around the mean values at the 16 week examination. At 28 weeks, although the Hand Eye score showed a more marked negative skew than at 16 weeks, the Table Top score was based on more items and showed a relatively normal distribution. Thus the distribution of the combined scores, the Total Hand Eye scores, at 28 weeks appears to be reasonably normal.

When the distributions of Hand Eye and Table Top scores at 16 and 28 weeks are examined, their relationship resembles that of the Physical and Sit Walk scores at the 40 and 52 week age levels. The scatterdiagrams (Diagrams 25 and 26) illustrate the relationship between the grouped distributions of the Hand Eye and Table Top scores at 16 and 28 weeks respectively. As the two sets of Hand Eye scores are not normally distributed, the relationships are not straight line ones at either 16 or 28 weeks. However, the scatterdiagrams show that no child with a Hand Eye score of less than 26 at either age level has obtained a Table Top score of more than 18 at 16 weeks or 80 at 28 weeks. Most children achieved a Hand Eye score between 26 and

DIAGRAM 25. Scatter diagram of the grouped distributions of the Hand Eye and Table Top scores of the main sample at the 16 week age level.

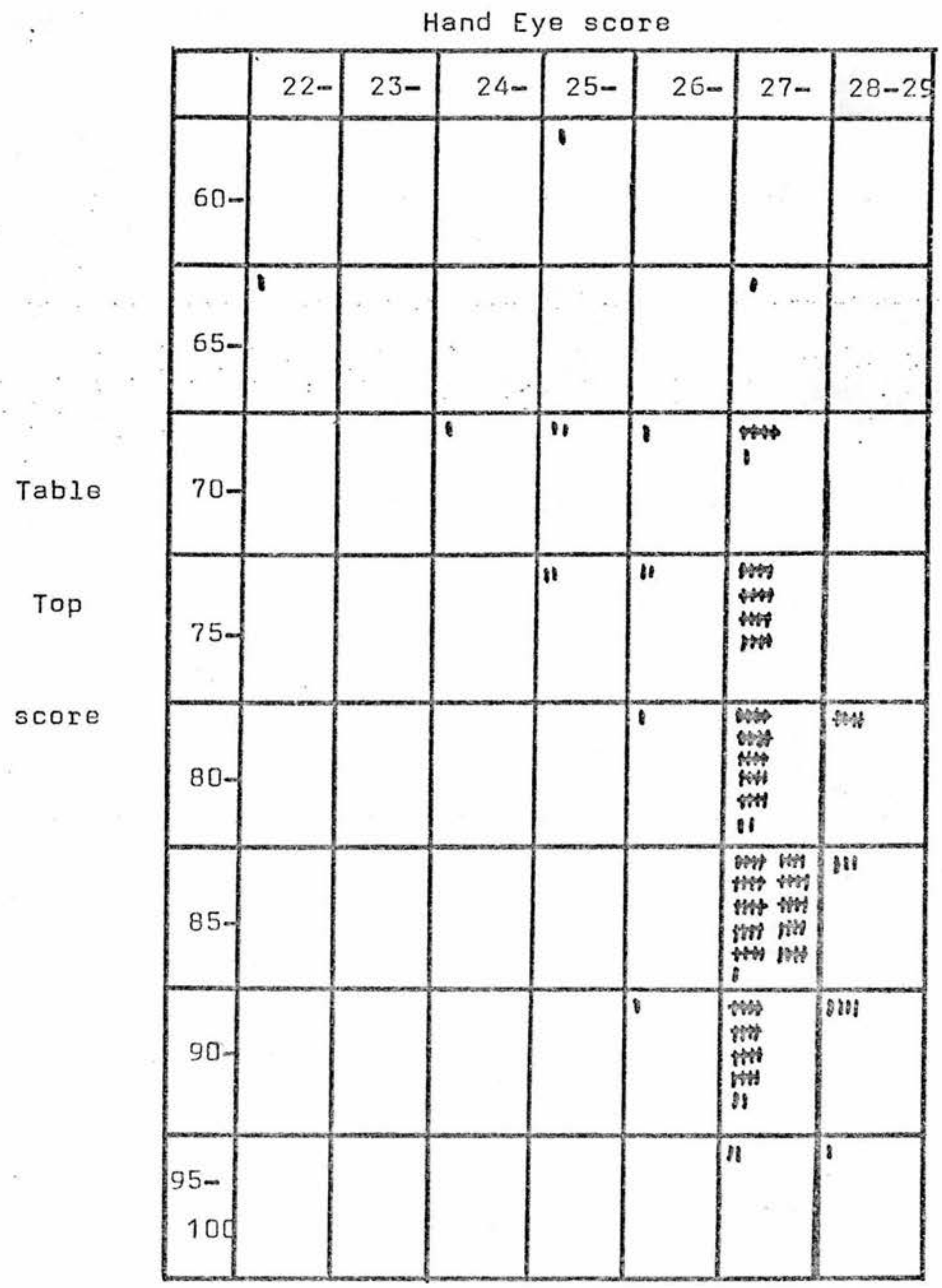
Hand Eye score

Table Top score

	22 –	24 –	26 –	28 –	30 – 32
12 –	I		III	I	
14 –	I	I	~~IIII~~ ~~IIII~~ ~~IIII~~ I	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~	~~IIII~~ ~~IIII~~
16 –	II	III	~~IIII~~ II	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~	~~IIII~~ ~~IIII~~ I
18 –			II	~~IIII~~ ~~IIII~~ I	IIII
20 – 22			I	IIII	III

One child, with a Hand Eye score of 15.1 and a Table Top score of 9.2, was outside the limits of this diagram.

DIAGRAM 26. Scatter diagram of the grouped distributions of the Hand Eye and Table Top scores of the main sample at the 28 week age level.



32 at 16 weeks and between 26 and 29 at 28 weeks; the corresponding Table Top scores at both age levels were scattered throughout the possible range. It seems, therefore, that, as for Gross Motor development, at the same level of physiological maturity of Fine Motor development, the actual performance of the children on various test items can vary widely. A basic level of physiological achievement must be reached before it is possible for the child to perform the test items used, but after this degree of maturity is reached, performance levels are varied and may be affected by other factors, environmental or obstetric.

These scores had been compiled before Sheridan (1971) suggested that the child's ability to grasp his feet while he was in supine, may be associated with his ability to sit unsupported. If this is so, this item may be better placed in the Physical score and not the Hand Eye score, as here. To examine this aspect of the scoring, the score obtained on this one item, the ability to grasp the feet when in supine, was subtracted from each child's hand eye score at 28 weeks and added to his Physical score at the same age level. This alteration made very little difference in the ranking levels of individual children for either score or in the overall distribution pattern of the Physical scores. However, when these new Hand Eye scores at the 28 week age level were examined, it was found that 147 of the 154 children examined had scored between 26.0 and 26.5. The other 7 children had considerably lower scores and their relative position remained unchanged by the subtraction of the score for this item. It appears that most of the variation between the children on the Hand Eye score at 28 weeks was the result of the score obtained on this one item, grasping the feet while in supine. It may be that by 28 weeks of age, handeye co-ordination is normally fully developed and that this item would be better placed in the Physical score.

SOCIAL DEVELOPMENT

The items used in the calculation of the Social score correspond to those of the Social and Language areas of the Developmental Screening Inventory and include items placed by Sheridan in her divisions of Vision and Fine Movements, Hearing and Speech, and Social Behaviour and Play. These items recorded the child's general understanding and social behaviour, his visual and auditory awareness, vocalization and feeding behaviour (Form 3, Appendix 1.)

Many of the items recorded on Form 3 could only be assessed on the mother's history, as the child was unlikely to exhibit his full range of vocalization and understanding under the test conditions. Where the performance of an item was not actually observed, this was shown in the coding used and the score allotted was less for this item than where the examiner had actually observed the achievement. Two items were excluded from all the scores calculated; these were the items relating to the childs attitude to strangers. The response to these items was inconsistent and seemed to have no connection with the childs developmental level as assessed on the other items of this score; the child's personality and the family atmosphere appeared to be the factors which influenced this aspect of behaviour. In addition, it was frequently observed that, even when a mother reported that a child was "very strange, with everybody", he showed no fear or nervousness of the examiner.

At the 40 week examination of the preliminary sample, the items recording the child's vocalizations were of little value because of the examiner's initial inexperience. These items were excluded from the Social score for the 40 week examination of the preliminary sample only; the items describing words spoken, the imitation of playful sounds, chuckling, screaming etc., were adequately recorded and so were not excluded from any of the Social scores calculated.

The range, modal and median values, means and standard deviations, and Pearson's coefficient of skewness for the Social scores are given in Table XXXIV.

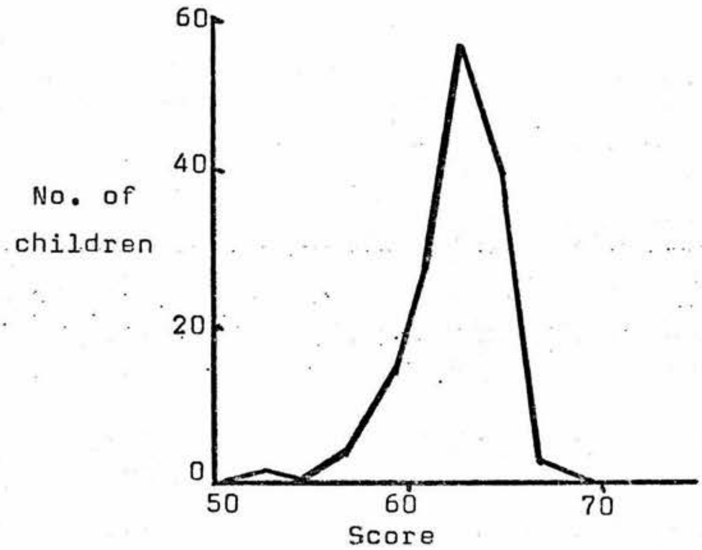
TABLE XXXIV - Range and mean values of Social scores.

Examination	Range	Mode	Median	Mean	S.D.	Skew	Sample Size
Main Sample							
4 weeks	5.1 - 10.9	10	9.7	9.7	0.69	0	168
16 weeks	52.2- 66.1	64	62.9	62.7	2.05	-0.03	147
28 weeks	52.4- 69.1	58	58.7	59.1	2.75	-0.44	154
40 weeks	50.1- 71.1	61	60.6	60.5	3.72	-0.08	153
52 weeks	46.3- 71.6	62	61.9	61.5	4.74	-0.25	143
Preliminary Sample							
40 weeks	42.2- 64.3	56	53.4	53.5	3.58	+0.08	97
52 weeks	50.3- 68.9	61	61.1	61.1	3.50	0	73

At each age level, the scores are distributed in a reasonably normal manner around the mean, with the number of scores occurring within one standard deviation from the mean not differing significantly from the expected number (Diagrams 27 and 28). Only a few of the

DIAGRAM 27. Distribution of the Social scores of the main sample at the 16 and 28 week age levels.

<u>16 week age level.</u>



<u>28 week age level.</u>

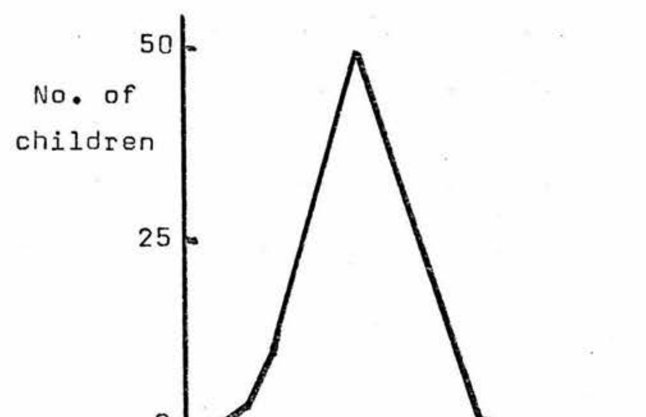
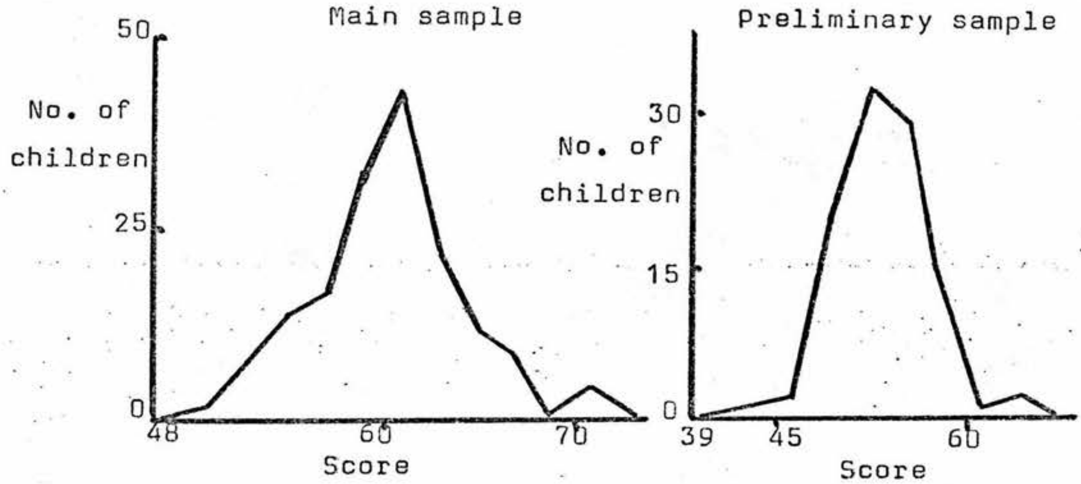
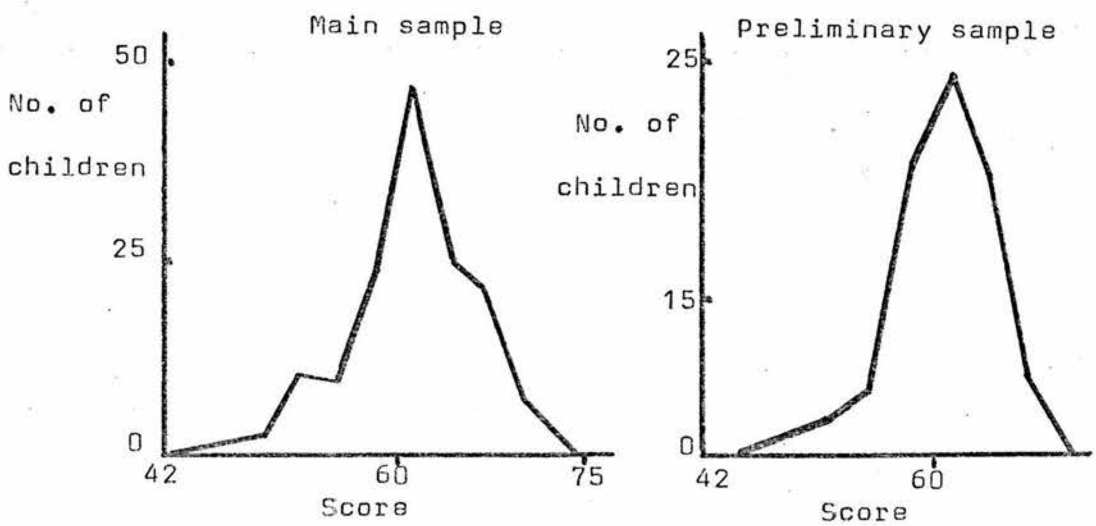


DIAGRAM 28. Distribution of the Social scores of the main and preliminary samples at the 40 and 52 week age levels.

40 week age level.



52 week age level.



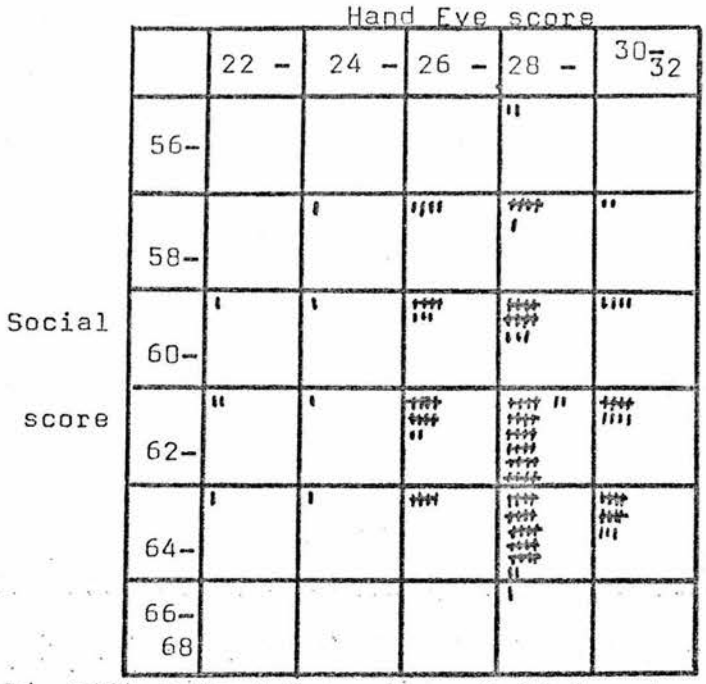
items included in this score were achieved by the 4 week old children but, although the range of scores at this age level is small, the scores obtained were spread throughout the range and the coefficient of skewness was 0. At the 16, 28, 40 and 52 week age levels, the distributions of the scores of the main sample are negatively skewed. At 40 weeks, the scores of the preliminary sample show a slight positive skewness and at 52 weeks, the scores are symmetrically distributed about the mean.

It has already been noted that, although on observed achievements, the two samples did not differ significantly in their social development, the reported behaviour of the preliminary sample was at a significantly higher level, particularly at the 40 week age level. The mothers seemed more likely to enhance their child's achievements when the examiner was completely unknown to her. This tendency might be sufficient to explain the different direction of the skewness observed in the distributions of the scores of the two samples at 40 weeks and the absence of skew in the preliminary sample at 52 weeks when a negative skewness was observed in the main sample at the same age level.

The mean scores obtained for the two samples at 40 weeks are not comparable as the items included in the scores were not the same for both samples. At 52 weeks, the standard error of the difference between the means of the Social scores of the two samples (0.57) was greater than the observed difference (0.4). Thus as with the Total Physical and Total Hand Eye scores, the Social scores indicate that the two samples may have been drawn from populations with similar characteristics.

The development of social skills is dependent on the maturation of the basic physical attributes assessed by the Physical and Hand Eye scores; a minimum level of physical maturity is necessary before social skills can be acquired. However, as with the Sit Walk and Table Top scores, once this basic level of maturity has been reached, the social accomplishments shown vary widely. The correlation coefficients (r) were calculated for the relationship of the Social score at 4 weeks with both the Hand Eye and Physical scores at this age level and of the Social scores at 16 and 28 weeks with the Physical scores at the same age levels. The remaining Hand Eye and Physical scores were not distributed normally and so their relationship with the Social scores was not a straight line one. The correlation coefficient was at a statistically significant level for the relationship between the Social and Hand Eye scores at 4 weeks ($r=0.25$, $p<.01$) and between the Social and Physical scores at 16 and at 28 weeks ($r= 0.42$ and 0.47, respectively, $p<.01$ in each case). The scatterdiagrams (Diagrams 29 - 32) indicate that a child with a low Hand Eye score at 16 or 28 weeks or a low Physical score at 40 or 52 weeks is unlikely to obtain a high Social score at these age levels but, once a basic level of maturity is achieved, children with similar Hand Eye and Physical scores show a wide variation in the Social scores which they obtain.

DIAGRAM 29. Scatter diagram of the grouped distributions of the Hand Eye and Social scores of the main sample at the 16 week age level.



One child, with a Hand Eye score of 15.1 and a Social score of 52.2, was outside the limits of the diagram.

DIAGRAM 30. Scatter diagram of the grouped distributions of the Hand Eye and Social scores of the main sample at the 28 week age level.

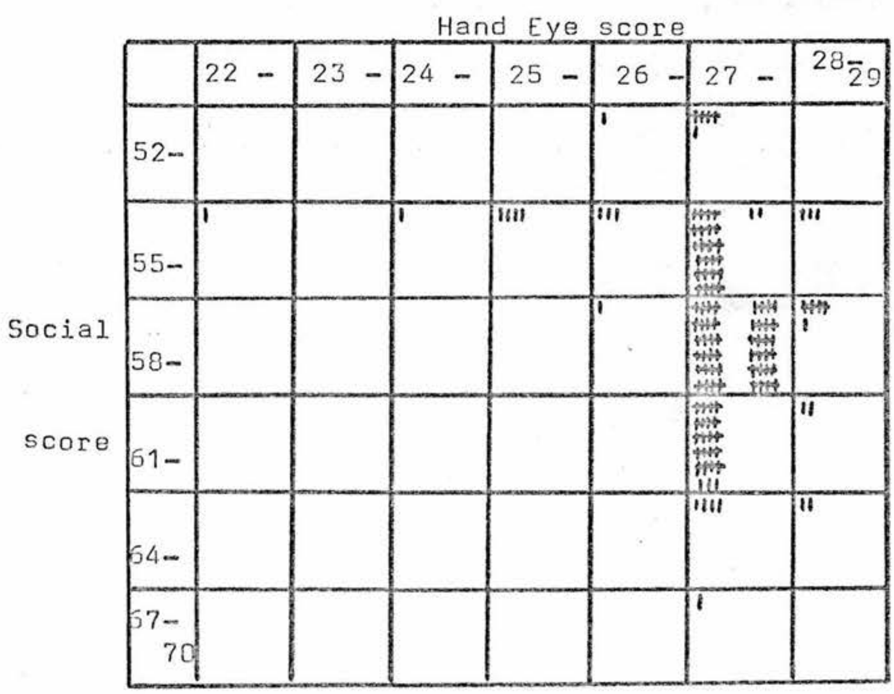


DIAGRAM 31. Scatter diagrams of the grouped distributions of the Physical and Social scores of the main and preliminary samples at the 40 week age level

Main sample.

Physical score

Social score	57 –	60 –	63 –	66 –	69 –	72–75
50–	3				3	1
54–		1	4	10	5	7
58–		2	8	6	22	37
62–			1	8	8	14
66–			1		2	6
70–74				1		2

One child, with a Physical score of 53.1 and a Social score of 44.9, was outside the limits of the diagram.

Preliminary sample.

Physical score

Social score	58 –	61 –	64 –	67 –	70–73
42–					1
46–		1	4	1	8
50–	3	1	8	12	18
54–		1	2	16	15
58–		1	1		3
62–66			1		1

DIAGRAM 32. Scatter diagrams of the grouped distributions of the Physical and Social scores of the main and preliminary samples at the 52 week age level.

Main sample.

Physical score

Social score	62 –	64 –	66 –	68 –	70 –	72–74
45–	1		1		1	
50–			1	2	10	1
55–	1	1	2	6	19	
60–		2	2	8	50	1
65–			1	7	24	
70–75					3	

Preliminary sample.

Physical score

Social score	62 –	64 –	66 –	68 –	70 –	72–74
50–				2	1	
54–	1		1	4	4	
58–		1	4	5	23	
62–				2	15	4
66–70				1	4	

THE PREDICTIVE VALUE OF DEVELOPMENTAL SCORES

In this investigation, it was not possible tocompare the results of infant testing with later developmental levels as the final examination occurred when the children were 52 weeks of age but the relationships between the scores obtained at the five examinations during the first year of life was examined for the main sample. Tables XXXV - XXXVII show the intercorellations for the Total Physical, Total Hand Eye and Social scores for each age level from 4 to 52 weeks and Tables XXXVIII and IXL the intercorrelations for the Sit Walk and Table Top scores at the 28, 40 and 52 week age levels. The Sit Walk and Table Top scores at 16 weeks were based on relatively few items so that the relationship between these scores and the later ones would not be reflected accurately by a correlation coefficient; the Hand Eye and Physical scores have not been included in these tables as, for most of the age levels studied, these scores were not distributed normally. The Total Hand Eye score at the 16 week age level was also not distributed normally and so the correlations of this score with the Total Hand Eye scores at the other age levels must be interpreted with caution and, as the Hand Eye score was not calculated at the 40 and 52 week age levels, the Table Top scores at these age levels are identical with the Total Hand Eye scores. As different numbers of children were examined at each age level, the number of pairs of scores used in the calculation of the correlation coefficients shown is not constant. The value of the correlation coefficient (r) which indicates that a relationship is statistically significant ($p < .05$) and unlikely to have occurred by chance, is related to the size of the groups examined; the coefficients which indicate a statistically significant relationship are marked with an asterisk in the tables. The value of the coefficient is also influenced by the slope of the line illustrating the relationship between any two sets of scores. As the range and dispersion of the scores was dependent on the performance in that aspect of development by the particular group studied at each age level, the intervals between scores at the different age levels were not evenly spaced. Therefore, the correlation coefficient cannot be compared directly.

TABLE XXXV - Correlation matrix of Total Physical scores.

Age Levels	Age Levels 4 weeks	 16 weeks	 28 weeks	 40 weeks	 52 weeks
4 weeks	1.00	0.20*	0.16*	0.13	0.03
16 weeks		1.00	0.49**	0.26**	0.24**
28 weeks			1.00	0.51**	0.43**
40 weeks				1.00	0.56**
52 weeks					1.00

TABLE XXXVI - Correlation matrix of Total Hand Eye scores

Age Levels	Age Levels 4 weeks	 16 weeks	 28 weeks	 40 weeks	 52 weeks
4 weeks	1.00	0.36**	0.25**	0.38**	0.19*
16 weeks		1.00	0.39**	0.33**	0.32**
28 weeks			1.00	0.46**	0.45**
40 weeks				1.00	0.68**
52 weeks					1.00

TABLE XXXVII - Correlation matrix of Social scores

Age Levels	Age Levels 4 weeks	 16 weeks	 28 weeks	 40 weeks	 52 weeks
4 weeks	1.00	0.20*	0.25**	0.17*	0.13
16 weeks		1.00	0.44**	0.39**	0.37**
28 weeks			1.00	0.47**	0.55**
40 weeks				1.00	0.30**
52 weeks					1.00

* $p < .05$ ** $p < .01$

TABLE XXXVIII - Correlation matrix of Sit Walk scores

Age Levels	28 weeks	40 weeks	52 weeks
28 weeks	1.00	0.51**	0.49**
40 weeks		1.00	0.79**
52 weeks			1.00

TABLE IXL - Correlation matrix of Table Top scores

Age Levels	28 weeks	40 weeks	52 weeks
28 weeks	1.00	0.54**	0.47**
40 weeks		1.00	0.69**
52 weeks			1.00

* $p < .05$ ** $p < .01$

In general, the correlation matrices shown in the tables indicate that the findings in this investigation are similar to those of other studies. There appears to be a statistically significant relationship for each aspect of development studied between the scores obtained by the children at the various age levels during their first year of life; the strength of this relationship tends to decrease as the time interval between examinations increases. It is possible that the Social score at the 4 week age level is of little value as the social development at this level is restricted. However, there was considerable variation in the scores obtained, even over the small range and so the 4 week Social scores were included in the correlation matrix.

123 children were seen at all five age levels and, to assess the practical value of the relationships demonstrated above, the 10%

(12 children) of this group with the lowest scores and the 10% with the highest scores at each age level were considered. It has been shown that there were no statistically significant differences in the distribution of environmental and obstetric factors between the children who were seen or not seen at each age level. However, it was found that although the children who were above the 90th percentile of this group tended also to be above the 90th percentile at each age level and in each score, there was a tendency for some of the children below the 10th percentile of this group to reach a higher percentile level in the total groups seen at the various age levels (Table XL). This finding may indicate that children with low scores were less likely to have been seen at each examination than those with high scores.

TABLE XL - Highest and Lowest percentile levels of children at the 10th and 90th percentiles respectively of the group of 123 children seen at all age levels.

Percentile	Total Physical score at 4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
10%	14%	12%	14%	13%	11%
90%	90%	90%	91%	91%	90%
	Total Hand Eye score at 4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
10%	15%	11%	10%	13%	11%
90%	89%	90%	90%	92%	91%
	Social score at: 4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
10%	15%	10%	13%	14%	12%
90%	89%	90%	90%	90%	90%

Despite the significant relationships between the scores in the same area of development at different age levels, shown in the correlation matrices of Tables XXV - IXL, very few of the children who were below the 10th or above the 90th percentiles of the group seen at each examination, at the 4 week age level remained within these percentile levels. As it is possible that the first examination at 4 weeks was too early for an adequate assessment to be made, the subsequent progress of those who were below the 10th or above the 90th percentiles at the 16 week examination was also examined. Tables XLI and XLII list the numbers within these groups who appear within the lowest and highest 10% respectively at the subsequent examinations.

TABLE XLI - Subsequent progress of those children below the 10th percentile scores at 4 or 16 weeks of the 123 children seen at all examinations.

Score	Number below 10th percentile at:				
	4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
Total Physical					
4 weeks	12	2	1	1	1
16 weeks	-	12	4	3	5
Total Hand Eye					
4 weeks	12	4	5	3	4
16 weeks	-	12	4	4	6
Social					
4 weeks	12	1	5	2	1
16 weeks	-	12	3	3	4

TABLE XLII - Subsequent progress of those children above the 90th percentile scores at 4 or 16 weeks of the 123 children seen at all examinations.

Score	Number above 90th percentile at: 4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
Total Physical					
4 weeks	12	2	1	1	0
16 weeks	-	12	3	5	1
Total Hand Eye					
4 weeks	12	2	3	1	0
16 weeks	-	12	3	1	3
Social					
4 weeks	12	1	1	1	0
16 weeks	-	12	1	4	4

The figures shown in Tables XLI and XLII indicate that the 16 week scores are slightly more reliable indicators of later development than are the 4 week scores and that the early Hand Eye scores bear a stronger relationship to subsequent scores in the same developmental area than do the early Total Physical or Social scores. It also seems that the predictive value is better for those within the lowest 10% of scores than for those in the highest. However, it was not always the same children who reappeared in the percentile groups examined at the later age levels; only one child was in the lowest 10% of the Total Hand Eye scores at each examination from 16 weeks onwards, 2 in the Total Physical score, and 2 in the Social score and one child was consistently above the 90th percentile of the Social score from the 16 week age level onwards.

The children who were below the 10th percentile or above the 90th percentile at the 52 week examination were scrutinized to determine the age level at which they first appeared in these percentile groups. The results are shown in Tables XLIII and XLIV and Diagrams 33 and 34.

TABLE XLIII - Earlier progress of children below the 10th percentile scores at 52 weeks.

Scores	Number below 10th percentile at: 4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
Total Physical	1	5	5	6	12
Total Sit Walk	4	6	2	6	12
Social	1	4	3	2	12

TABLE XLIV - Earlier progress of children above the 90th percentile scores at 52 weeks.

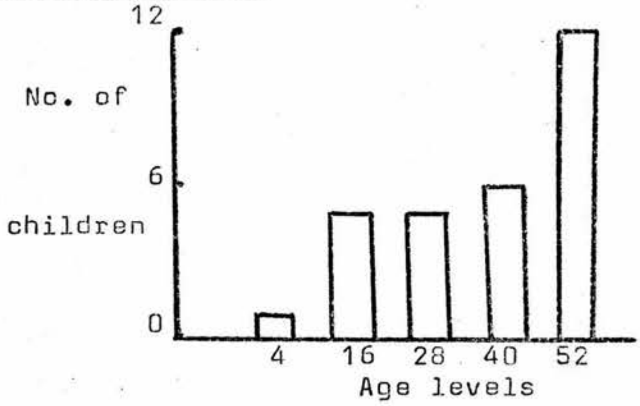
Scores	Number above 90th percentile at: 4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
Total Physical	0	1	3	5	12
Total Sit Walk	0	3	2	2	12
Social	0	4	1	5	12

Here too there appears to be a stronger relationship between the scores in each aspect of development for the children with low scores than those with high scores but once more, the children examined did not appear consistently in the groups studied at each age level.

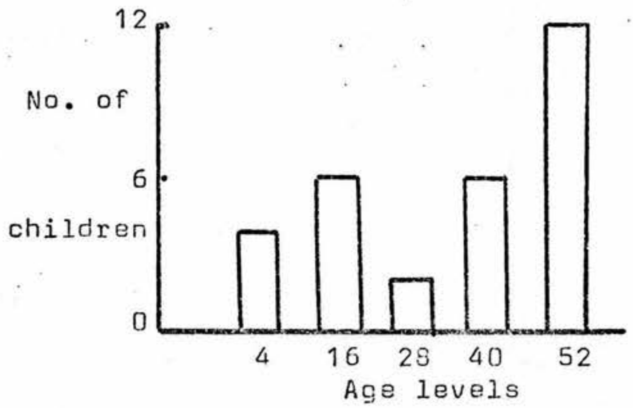
From this scrutiny of the children with low and high scores, it seems that, despite the apparently close relationship between scores obtained in each aspect of development at the different age levels during the first year of life, demonstrated by the statistically significant correlation coefficients, early scores are of little use in the prediction of achievement levels at one year.

DIAGRAM 33. Earlier progress of the children with scores below the 10th percentile at the 52 week age level.

Total Physical score.



Total Hand Eye score.



Social score.

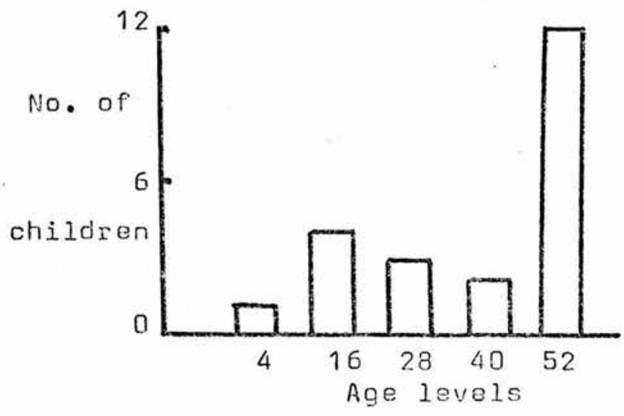
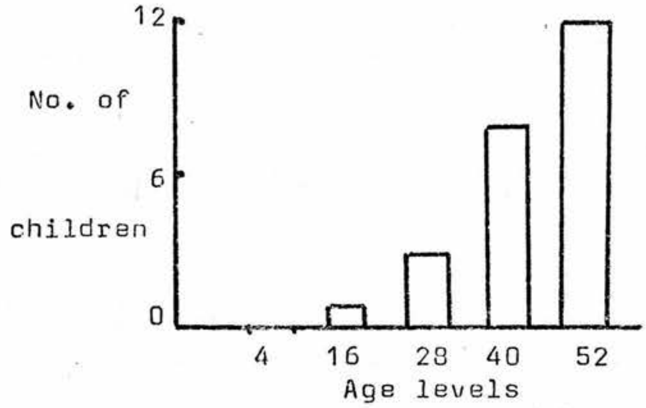
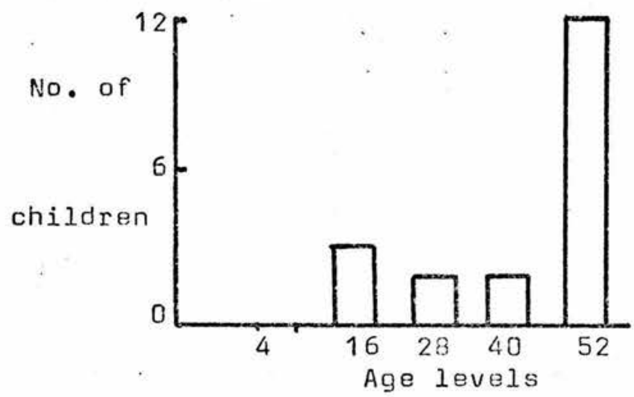


DIAGRAM 34. Earlier progress of the children with scores above the 90th percentile at the 52 week age level.

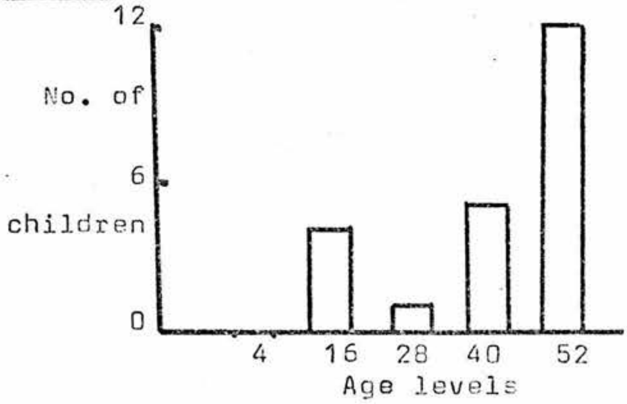
Total Physical score.



Total Hand Eye score.



Social score.



The best predictor would appear to be the Total Hand Eye score at 16 weeks, but even here only 6 of the 12 children who were below the 10th percentile at 16 weeks were also below the 10th percentile at 52 weeks. It seems that, at a superior level of performance, very few children who were above the 90th percentile at 16 weeks were still at this level at 52 weeks; the maximum number occurred with the Social score where 4 of the 12 who were above the 90th percentile at 16 weeks were also above the 90th percentile at 52 weeks. Similarly, of those children with scores below the 10th percentile at 52 weeks, no more than half obtained scores which placed them below the 10th percentile at any other age level; of the children with scores above the 90th percentile at 52 weeks, an even smaller proportion obtained scores which placed them above the 90th percentile at the other age levels and none of them had scores at this level at the 4 week examination. Thus, although scoring systems are a necessary part of a research project and may be useful in indicating the progress of an individual child over a period of time, early developmental scores or quotients appear to be of little value in the prediction of the later developmental progress of individual children.

Early detection of children with superior intellectual ability is not of great importance but the early diagnosis of mental retardation might be advantageous. These findings suggest that assessment early in a child's life is of little value in predicting that individual's later ability; such early testing may be slightly more useful in detecting the retarded than the advanced child. Where a child is seen on one occasion only, an assessment detects variations from the norms for that age level only. Consecutive assessments will provide a measure of the rate of development in an individual child and this may be of much greater value in assessing his future developmental progress.

THE RELATIONSHIP BETWEEN SOME SOCIAL AND OBSTETRIC FACTORS AND THE DEVELOPMENTAL SCORES OBTAINED DURING THE FIRST YEAR OF LIFE

The developmental scores were used to assess the effect of some social and obstetric factors on developmental progress during the first year of life. The mean values and standard deviations for each score at relevant age levels had been calculated. It was possible, therefore, to compare the appropriate mean values with the mean scores obtained in each area of development, at each age level studied, by various sub-groups of the samples. When a difference was observed in the mean scores obtained by these sub-groups at any level, statistical tests were made to determine whether the difference noted was statistically significant or if it could have occurred by chance. In most cases, the standard error of the difference between the observed means was calculated and this value compared with the actual difference between the means. When the observed difference between the means exceeds twice the value of the standard error of the means, it is unlikely that the two means differ by chance alone ($p < .05$) and the sub-groups considered are likely to have reached different levels of development in the skills measured by the score concerned. Where the difference between the means exceeds the value of the standard error of the means by a factor of 2.6 or more, it is even less likely that the observed difference is the result of chance ($p < .01$). The standard deviation of both means and the size of both sub-groups affect the value of the standard error of the means and the test is not reliable unless the total number of cases observed exceeds 30. In the few instances where the total number of scores involved was less than 30, the 't' test was used. In this procedure, the value of 't' obtained also reflects the sizes of the groups considered and the standard deviation of the means; the level of significance is obtained by consulting standard tables of 't' values (Fisher and Yates, 1957).

The 't' test allows more accurate compensation to be made for the greater variability of small samples.

For some of the factors studied, the sub-groups obtained were very small, particularly in the preliminary sample. Therefore, it was possible to assess the effect on the preliminary sample of the major items only.

SOCIAL FACTORS

It is difficult to examine any one social factor in isolation. In both samples, family size was related to social class, particularly to that of the mother before marriage (Table XLV and XLVI); there were more large families at the lower end of the social scale and the mothers who had had professional or secretarial training were less likely to have more than two children under five years of age at the time of the survey. (Table XLVII).

TABLE XLV - Distribution of family size by social class of father.

Family Size	Social class of father				
	I & II	IIIa	IIIb	IV, V & unemployed	Total
Preliminary Sample					
1	5	3	14	12	34
2 or 3	3	3	10	20	36
>3	-	2	7	18	27
Total	8	8	31	50	97
			$(X^2 = 4.58, p < .05)$		
Main Sample					
1	15	6	23	19	63
2 or 3	13	8	23	33	77
>3	2	3	11	12	28
Total	30	17	57	64	168
			$(X^2 = 2.96$, not significant)		

TABLE XLVI - Distribution of family size by social class of mother before marriage.

Family Size	Social class of mother I & II	III	IV & V	Total
Preliminary Sample				
1	1	18	15	34
2 or 3	1	11	24	36
>3	-	5	22	27
Total	2	34	61	97
			(X^2 = 7.73, p < .01)	
Main Sample				
1	14	20	29	63
2 or 3	7	23	47	77
>3	2	5	21	28
Total	23	48	97	168
			(X^2 = 6.88, p < .01)	

TABLE XLVII - Distribution of the number of children aged less than 5 years by social class of mother before marriage.

No. of children 5 years	Social class of mother I & II	III	IV & V	Total
Preliminary sample				
1	1	22	27	50
2	1	9	22	32
> 2	-	3	12	15
Total	2	34	61	97
		(X^2 = 3.20, not significant)		
Main Sample				
1	15	21	40	76
2	4	21	36	61
> 2	4	6	21	31
Total	23	48	97	168
		(X^2 = 3.09, not significant)		

There was a strong relationship between the mother's social class before marriage and the father's social class but more than half of the men and a fifth of the women had chosen partners from a social class lower than their own (Table XLVIII)

TABLE XLVIII - Social class of father and of mother before marriage.

Social class of father -1,II&IIIa	Social class of mother I & II	IIIa	IIIb,IV & V	Total
Preliminary sample	1	6	8	15
Main sample	16	16	15	47

Social class of father - IIIb	Social class of mother I,II & IIIa	IIIb	IV & V	Total
Preliminary sample	4	10	17	31
Main sample	17	8	32	57

Social class of father - IV, V and unemployed	Social class of mother I,II & III	IV & V	Total
Preliminary Sample	11	40	51
Main Sample	10	54	64

The mother's height and age were also related to social class. The height was not recorded in the notes of 33 (34%) of the mothers in the preliminary sample but in the main sample, there were more smaller mothers in the lower social classes ($p < .01$); 22 (13%) of the mothers in this sample were less than 5 feet tall. In both samples, there were more young mothers (less than 20 years of age) and more older mothers (more than 30 years of age) in the lower social class groups ($p < .05$).

With a larger sample, it might have been feasible to assess the effect of these social factors, in combination, on the developmental scores. Unfortunately, the small samples used in this study made this impractical. The relationships of the mean scores with maternal and paternal social class, singly and together, family size and number of children in the family aged less than 5 years, maternal height and maternal age, were examined separately.

For this part of the study, the Total Physical and Total Hand Eye scores were split into their component scores, Physical and Sit Walk scores and Hand Eye and Table Top scores. There appears to be physiological and adaptive aspects of these areas of development and it is possible that one aspect might be more susceptible to the factors studied; if the combined scores were examined, any such effect might be obscured. The scores examined at each age level in this part of the study are shown in Table IL. The mean scores were calculated for all the scores available at each age level for each factor studied. It was found that the social score at the 4 week age level showed little variation. Most of the children had reached the optimum level of maturity in the skills measured by the Hand Eye score at 28 weeks and the Physical score at 52 weeks and so there could be little variation in the mean scores obtained for these.

TABLE IL - Scores used in assessing the effect of social and obstetric factors on development.

Score	Age Levels				
	4 weeks	16 weeks	28 weeks	40 weeks	52 weeks
Physical	Yes	Yes	Yes	Yes	-
Sit Walk	-	-	Yes	Yes	Yes
Hand Eye	Yes	Yes	-	-	-
Table Top	-	Yes	Yes	Yes	Yes
Social	-	Yes	Yes	Yes	Yes

SOCIAL CLASS

The effect of social class on the developmental scores obtained by the children studied was assessed by examining the mean scores obtained by the children from different social class groups. The social class grading used was the Registrar General's Classification (1960); professional and managerial occupations are placed in social class I or II, clerks and other "white collar" workers are in class IIIa and skilled manual workers in IIIb, the semi-skilled are in social class IV and the unskilled manual workers in social class V. For this study, the unemployed were coded separately but, as there were very few in this category they were frequently grouped with social class V.

The social class of the father at the time of the survey and of the mother before marriage were both considered and a combined social class grouping drawn up (Table XLVIII). It was observed that the performance levels of the children whose fathers were from social class IIIa (SCFIIIa) were closer to those from SCFI and SCFII than to those from SCFIIIb. It was necessary to combine some groups to obtain numbers large enough for valid comparisons to be made and four groups were used in the study of the effect of the father's social class, SCFI, II and IIIa, SCF IIIb, SCF IV, and SCF V and the unemployed (SCF V and U). There appeared to be a greater difference in performance levels between the children whose mothers had been in social class I or II before marriage (SCM I and II) and those whose mothers were from social class IIIa, than between those from SCM IIIa and those from SCM IIIb. There were few mothers from SCM IIIb, as apprentice training for a skilled manual job is less common for women than for men; these women tended to be similar to those from IIIa in their outlook and attitudes. The mothers were divided into three groups by social class, SCM I and II, SCMIII, and SCM IV and V. Only 4 women had been officially unemployed before marriage and all four were occupied in housework in the family home and so were included in the SCM V group.

At each age level, a different number of children were examined and so the number of children in any subgroup studied was not constant. The number of children seen at each age level and their distribution by social class, and by the other social and obstetric factors studied will be found in Appendix 6. The distribution of the mean developmental scores by social class are shown in Tables L - LIV. Where the difference between two or more mean scores at any age level is statistically significant ($p < .05$) the scores are marked with an asterisk.

TABLE L - Distribution of the mean values of the Physical scores by social class of father and of mother before marriage.

Social Class	Main Sample 4 weeks	16 weeks	28 weeks	40 weeks	Prelim. sample 40 weeks
Sample Mean	63.4	54.0	49.2	69.8	68.6
FATHER					
SCF I?II and IIIa	64.7*	54.2	49.8*	69.5	67.7
SCF IIIb	63.4	54.8	49.8	70.6	68.5
SCF IV	62.5	52.9	49.0	70.7	69.1
SCF V & U	62.4*	53.1	47.5*	68.7	69.0
MOTHER					
SCM I & II	64.3	54.5	49.7	69.3	Not calc.
SCM III	63.8	54.0	49.4	69.9	68.7
SCM IV & V	62.9	53.8	49.0	70.0	68.8

(TABLE L .. Cont)

Social Class	Main sample 4 weeks	16 weeks	28 weeks	40 weeks	Prelim. sample 40 weeks
Sample mean	63.4	54.0	49.2	69.8	68.6
COMBINED					
SCF I,II and IIIa					
SCM I,II and IIIa	64.8	54.6	49.8	69.8	66.9
SCM IIIb, IV and V	64.5	53.7	49.7	70.3	68.6
SCF IIIb					
SCM I,II and III	63.2	54.0	49.6	70.3	69.4
SCM IV & V	63.6	55.4	49.9	70.8	67.8
SCF IV, V and U					
SCM I,II and III	63.5	53.0	47.5	70.9	68.4
SCM IV & V	62.2	53.0	48.3	69.2	69.2

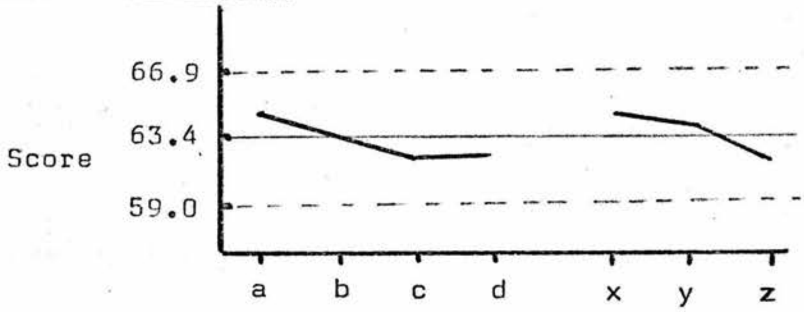
TABLE LI - Distribution of the mean values of the Sit Walk scores by social class of father and of mother before marriage.

Social Class	Main Sample 28 weeks	40 weeks	52 weeks	Prelim. sample 40 weeks	52 weeks
Sample Mean	41.3	43.8	44.2	43.6	43.8
FATHER					
SCF I,II and IIIa	41.7*	42.8	43.7	42.0	43.6
SCF IIIb	42.1	45.1	45.1	43.0	42.8
SCF IV	40.4	46.2*	44.2	44.2	45.4
SCF V & U	40.0*	41.7*	43.2	44.9	43.5
MOTHER					
SCM I & II	41.4	42.0	42.2	Not calculated	
SCM III	41.5	44.1	44.0	42.7	44.5
SCM IV & V	41.2	44.1	44.8	44.5	44.0
COMBINED					
SCF I,II and IIIa					
SCM I,II and IIIa	41.5*	42.3*	42.8	40.8	40.8
SCM IIIb, IV and V	42.2*	43.6*	45.8	43.1	46.9
SCF IIIb					
SCM I,II and III	41.7	44.0	43.8	44.3	45.8
SCM IV & V	42.4	46.0	46.2	42.0	41.2
SCF IV, V and U					
SCM I,II and III	40.3	46.4	44.6	41.9	42.7
SCM IV & V	40.1	42.8	43.4	45.3	45.1

The distributions of the mean Physical and Sit Walk scores by social class of father and of mother for the main sample are illustrated in Diagrams 35 and 36. The mean value, with one standard deviation in

DIAGRAM 35. Distribution of the mean values of the Physical scores of the main sample by social class of father and of mother before marriage, at the 4, 16, 28 and 40 week age levels.

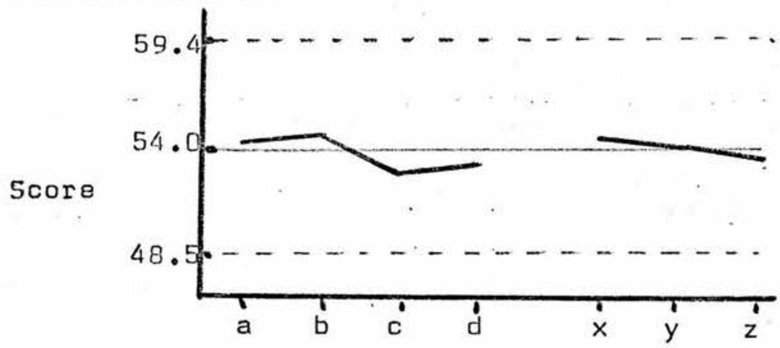
4 week age level.



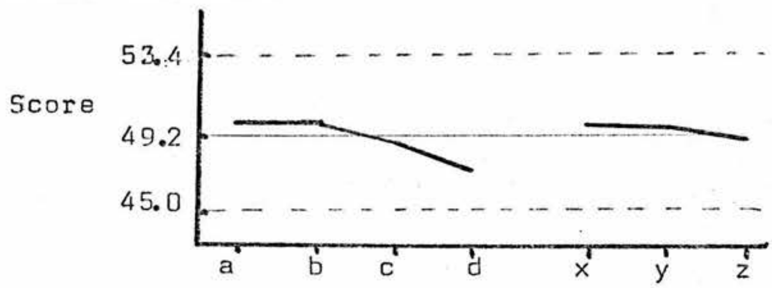
Key for Diagrams 35 - 39.

a - SCF I, II and IIIa.
b - SCF IIIb.
c - SCF IV.
d - SCF V and unemployed.
x - SCM I and II.
y - SCM III.
Z - SCM IV and V.

16 week age level.



28 week age level.



40 week age level.

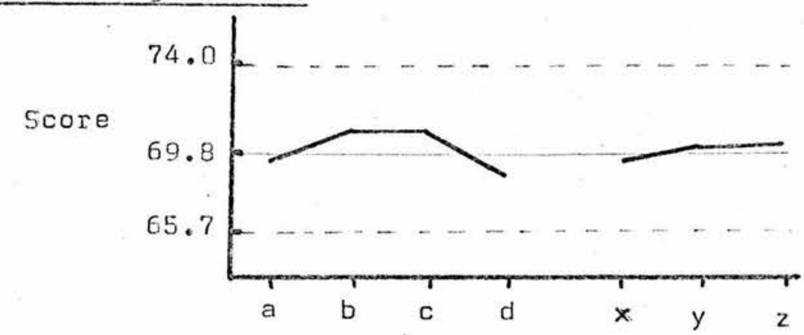
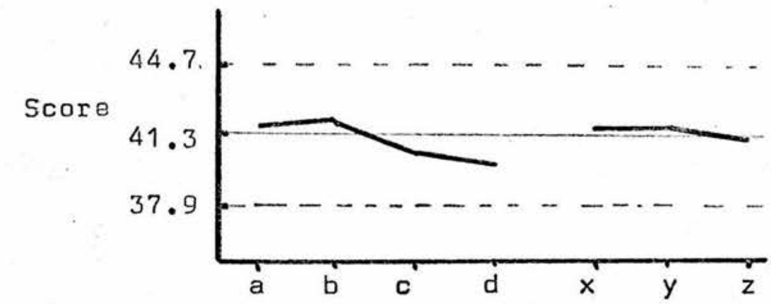
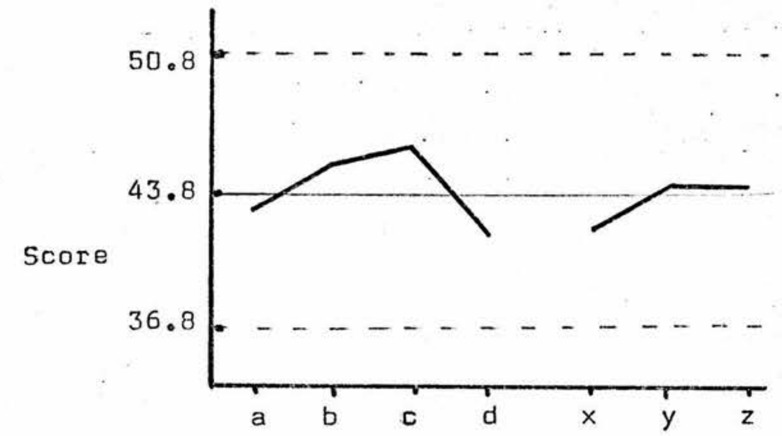


DIAGRAM 36. Distribution of the mean values of the Sit Walk scores of the main sample by social class of father and of mother before marriage, at the 28, 40 and 52 week age levels.

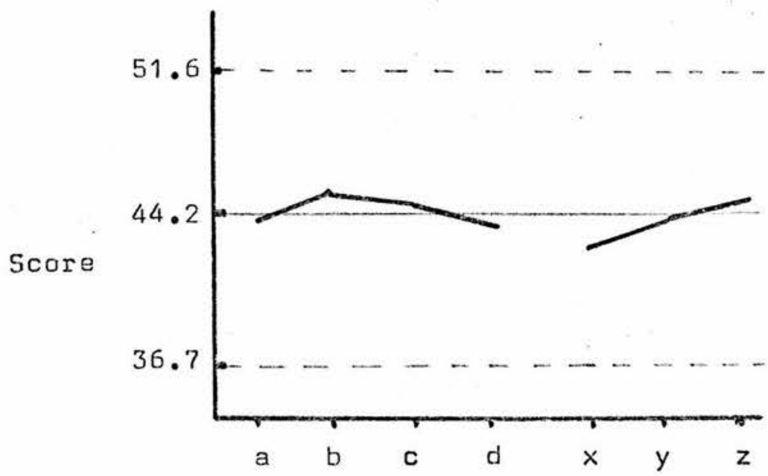
28 week age level.



40 week age level.



52 week age level.



each direction, for the scores of all the children seen at each age level is indicated on each diagram.

In Diagram 35, the mean value of the Physical score for the children of fathers in the lower social class groups (SCF V and U) was lower at each age level; the difference between the SCF I & II and the SCF V & U scores at 4 and 28 weeks was statistically significant ($p < .01$ and $< .05$, respectively). By 40 weeks, there was no statistical significance but the trend remained. There was very little difference in the mean Physical scores when examined by social class of mother and no consistent pattern appeared when the effect of the combined social classes were considered. The mean Sit Walk scores are shown in Diagram 36. At 28 weeks, the pattern is similar to that of the Physical scores; there was little difference in the mean scores obtained by the children from different maternal social classes but the mean score of the children from SCF V & U was lower than that of the other social class groups; the difference between the SCF V & U score and the SCF I,II & IIIa score was significant at the 0.05 level. By 40 weeks, the SCF IV group had the highest mean score ($p < .05$) and at 52 weeks, there was little difference in the mean scores. At 40 and at 52 weeks, there was a tendency for the children from the lowest maternal social class groups to have the highest mean score but this was not statistically significant. When the distribution of scores for the combined social class groups was examined (Table LI), it was observed that, in the SCF I,II & IIIa and SCF IIIb groups, the children whose mothers came from lower social classes had higher mean scores; this difference was statistically significant ($p < .05$) at both 40 and 52 weeks for the SCF I,II & IIIa group. The pattern in the preliminary sample was similar but no significant differences were detected; in the preliminary sample, there were only two mothers in the SCM I & II group and so no mean scores were available for that group.

It seems that, although the children studied whose fathers were from the higher social classes showed a higher level of physical development up to the age of 28 weeks, this was not continued as accelerated progress in sitting and walking development at 40 and 52 weeks. The social class of the mother may have some relationship to sitting and walking development, with development being faster where the mother is from a lower social class. The evidence is too slight for definite conclusions to be drawn but it is possible that the relationship observed may be related to different methods of child rearing in the different social classes, with children from the lower social classes being less restricted and so freer to develop the skills of crawling and walking alone.

TABLE LII - Distribution of the mean values of the Hand Eye scores by social class of father and of mother before marriage.

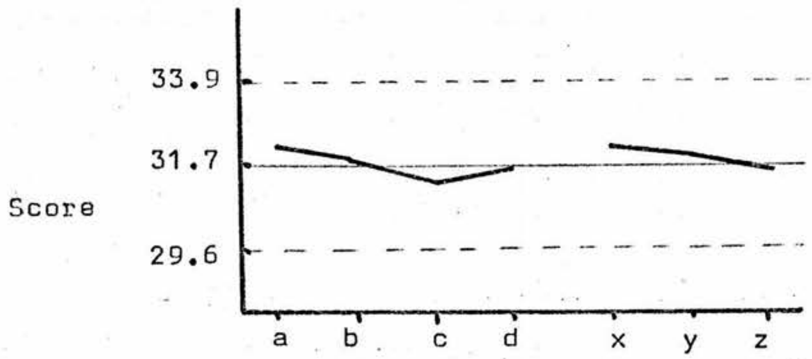
Social Class	4 weeks	16 weeks
Sample mean	31.7	28.7
FATHER		
SCF I,II and IIIa	32.6*	29.1
SCF IIIb	31.9	28.9
SCF IV	30.5	27.7
SCF V & U	31.2*	28.5
MOTHER		
SCM I & II	32.5*	29.0
SCM III	32.0	28.9
SCM IV & V	31.5*	28.5
COMBINED		
SCF I,II and IIIa		
SCM I, II and IIIa	32.8	29.1
SCM IIIb, IV and V	32.3	29.0
SCF IIIb		
SCM I,II and III	31.8	29.0
SCM IV & V	31.9	28.8
SCF I, II, IV and U		
SCM I,II and III	30.5	28.3
SCM IV & V	31.0	28.1

TABLE LIII - Distribution of the mean values of the Table Top scores by social class of father and of mother before marriage.

Social Class	Main Sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim. sample 40 weeks	52 weeks
Sample mean	16.6	84.6	83.3	84.5	83.0	83.9
FATHER						
SCF I, II and IIIa	17.0*	86.5*	87.0*	86.1*	85.3*	86.7*
SCF IIIb	16.4	85.1	84.4	85.4	84.2	84.3
SCF IV	16.8	81.7	83.2	84.5	84.0	85.8
SCF V & U	16.2*	82.8*	76.7*	80.3*	79.5*	79.8*
MOTHER						
SCM I & II	17.0	86.5*	86.9*	88.1*	Not calculated	
SCM III	17.1	85.7	86.3	86.0	85.2*	85.8
SCM IV & V	16.2	83.5*	80.9*	82.7*	81.8*	83.0
COMBINED						
SCF I,II and IIIa						
SCM I,II and IIIa	17.1	87.2	88.4	86.1	87.1	86.2
SCM IIIb IV and V	16.8	85.0	84.2	86.1	83.5	87.3
SCF IIIb						
SCM I,II and III	17.0	85.9	86.6	87.3*	84.7	86.7
SCM IV & V	15.9	84.5	82.7	83.7*	83.8	83.1
SCF IV, V and U						
SCM I,II and III	17.4	83.1	83.1	86.6	85.1*	83.3
SCM IV & V	16.2	82.2	78.4	81.3	80.6*	82.5

DIAGRAM 37. Distribution of the mean values of the Hand Eye scores of the main sample by social class of father and of mother before marriage, at the 4 and 16 week age levels.

4 week age level.



16 week age level.

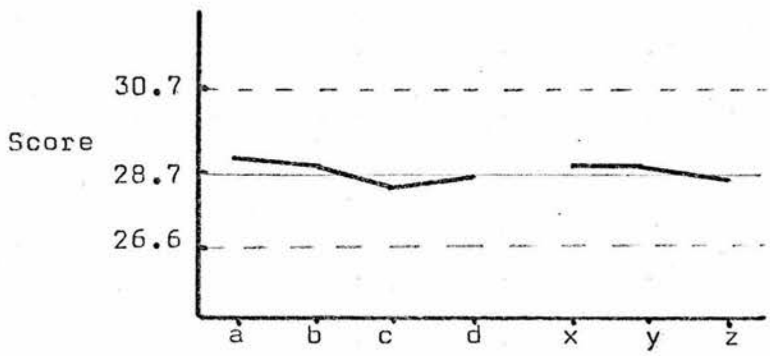
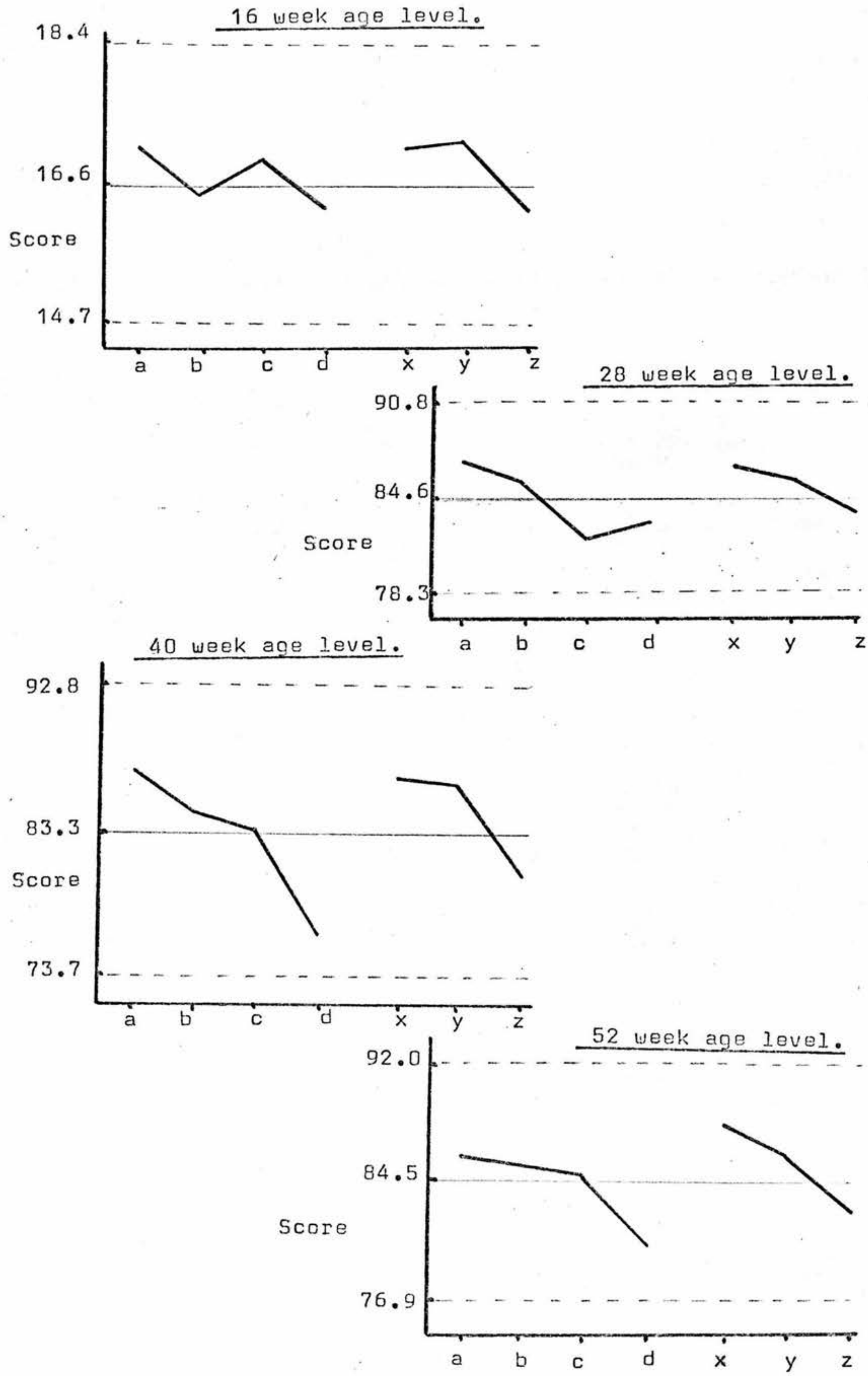


DIAGRAM 38. Distribution of the mean values of the Table Top scores of the main sample by social class of father and of mother before marriage, at the 16,28, 40 and 52 week age levels.



The mean Hand Eye scores by social class are listed in Table LII and shown in Diagram 37. There was a tendency for the mean Hand Eye score to decrease as the social class scale is descended: the difference between the mean scores for the upper social class groups (SCF I, II & IIIa and SCM I & II) and the lowest groups (SCF V & U and SCM IV & V) was statistically significant at the 4 week age level. ($p < .05$). At 28 weeks, a similar trend was still present but less marked. No consistent patterns were detected when the distribution of mean scores by the combined social class groupings was studied.

Diagram 38 illustrates the relationship between the mean Table Top scores of the main sample and social class. (Table LIII). At each age level there was a similar relationship between the scores and the social class groupings; the mean scores increased as the social scale was ascended. The relationship was statistically significant at each age level from 16 weeks to 52 weeks in the main sample and at both 40 and 52 weeks in the preliminary sample for father's social class; the relationship between the scores and the mother's social class was statistically significant at the 28, 40 and 52 week age levels in the main sample and at 40 weeks in the preliminary sample. In the combined social class groupings, at each paternal social class level, there was a tendency for children to score higher marks if their mother was from the upper half of the social class scale.

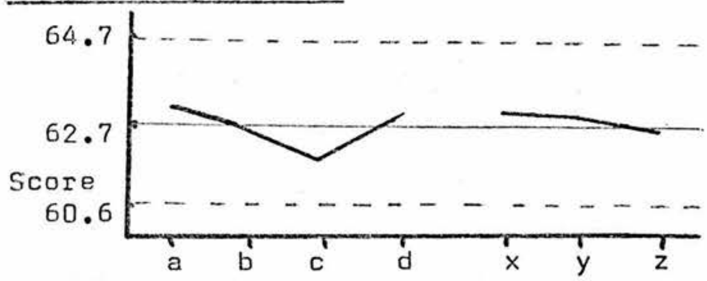
These results indicate that, during the first few months of life, hand eye co-ordination may develop more quickly in children whose parents are from the higher social classes and, during the remainder of the first year of life, the performance of these children on the tests of manipulative ability and adaptive behaviour used in this study, is at a higher level than that of children from the lower social class groups. There is an indication that the relationship between these scores and father's social class is stronger than that with the mother's social class. This is surprising as it is likely that the contact and influence of the mother is greatest during this first year of life. Many variables may be obscured by the social class groupings; different outlooks and standards, both moral and monetary have become associated with the various social classes. The "Table Top" tests may be culturally biased and so favour the child from a middle class background. They are similar to the tests used to assess non-verbal intelligence in older children. In general, adults and older children from social classes I and II obtain higher scores on such tests than those from the lower social classes do. It may be that the results obtained here indicate that the children of parents from the higher social classes have "inherited" the ability to perform well on intelligence testing procedures.

TABLE LIV - Distribution of the mean values of the Social scores by social class of father and of mother before marriage.

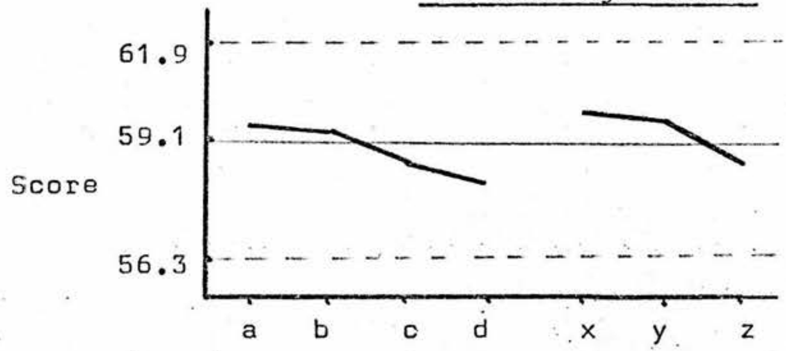
Social Class	Main Sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim Sample 40 weeks	52 weeks
Sample Means	62.7	59.1	60.5	61.5	53.5	61.1
FATHER						
SCF I,II and IIIa	63.1	59.6*	61.6*	62.6*	53.4	61.0
SCF IIIb	62.6	59.5	61.1	61.7	54.9	63.5
SCF IV	61.9	58.6	60.1	62.8	52.6	59.9
SCF V & U	62.7	58.1*	58.3*	58.7*	52.7	59.4
MOTHER						
SCM I & II	63.0	60.0*	62.2*	63.1*	Not calculated	
SCM III	62.9	59.8	62.0	63.1	52.9	61.6
SCM IV & V	62.5	58.5*	59.3	60.2*	53.8	60.8
COMBINED						
SCF I, II and IIIa						
SCM I,II and IIIa	63.4	59.8	62.3	62.6	53.9	60.8
SCM IIIb, IV & V.	62.5	59.0	60.2	62.4	52.8	61.1
SCF IIIb						
SCM I,II and III	62.9	60.1	62.4*	63.2*	54.5	64.9
SCM IV & V	62.4	59.0	60.1*	60.5*	55.3	62.7
SCF IV, V and U						
SCM I,II and III	62.6	59.6	61.2*	63.7*	51.3	59.4
SCM IV & V	62.3	58.1	58.6*	59.7*	53.1	59.7

DIAGRAM 39. Distribution of the mean values of the Social scores of the main sample by social class of father and of mother before marriage, at the 16, 28, 40 and 52 week age levels.

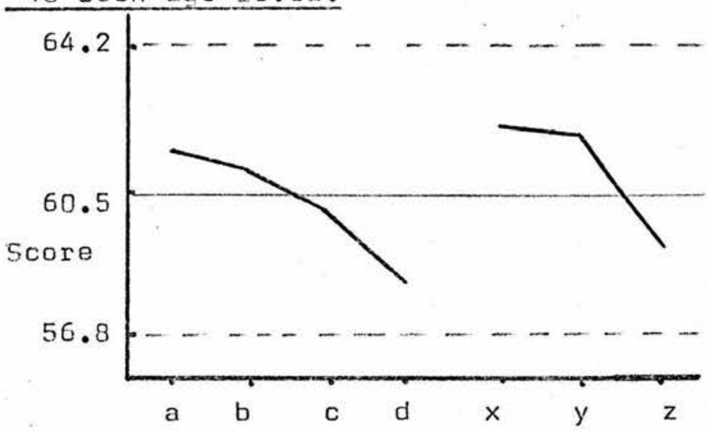
16 week age level.



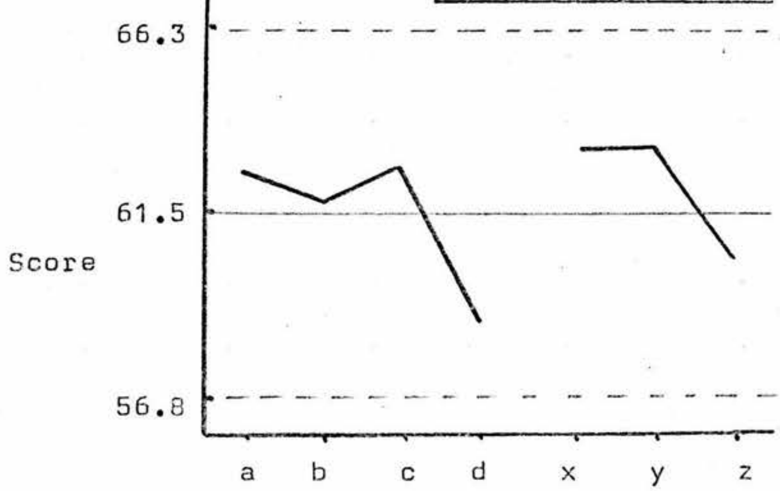
28 week age level.



40 week age level.



52 week age level.



The distribution of the mean Social scores of the main sample by social class is shown in Diagram 39. There were no consistent relationships between the mean Social scores of the preliminary sample and social class of either father or mother. In the main sample, the patterns obtained are very similar to those seen for the Table Top score. From 28 weeks, the mean scores of the children from the lower social classes were less than those of the rest of the sample. When examined by social class of father, there appeared to be a gradient of the scores with the SCF I & II group at the top and the SCF V & U group at the bottom of the scale ($p < .05$ at 28 weeks and $P < .01$ at 40 and 52 weeks). There was little difference in the Social scores obtained from 28 weeks by the children whose mothers' social class was I, II or III before marriage; those whose mothers' social class was IV or V had a significantly lower mean social score at each age level from 28 weeks ($p < .01$). In the combined social class groups, the mother's social class seemed of little importance where the father was from social class I, II or IIIa; at 40 and 52 weeks, the mean social score of the children whose fathers were in social classes IIIb, IV or V or were unemployed, was significantly higher if their mother was from a higher social class ($p < .01$).

It was considered that the mothers of the children in the preliminary sample were more likely to enhance their childrens' social prowess when questioned by the investigator, than were the mothers of the main sample. This may explain the absence of a relationship between the Social scores of the preliminary sample and social class, despite the strong relationship found in the main sample. It is possible that the items used to compile the Social score, like those of the Table Top score, are culturally biased and may favour the children from middle class families. Or it may be that such children are also exposed to a more stimulating environment and are given a fair amount of adult attention in play, as well as in care, and this may enable them to achieve higher levels of social development at an early age.

The results given here indicate that, during the first year of a child's life, the social class of both parents may have a definite effect on his developmental progress, as measured by developmental testing procedures. The children from the upper social class groups were more advanced in adaptive and manipulative skills and in their social development from 28 weeks onwards. Hand eye co-ordination and physical skills also appeared to develop faster in these children during the first few months of life. The development of mobility seemed to progress more quickly in children whose fathers were from the upper social class groups but there was also a tendency within each social class group for the children whose mothers were in social class IV or V before their marriage to be more accomplished in these skills.

FAMILY SIZE

TABLE LV - Distribution of the mean values of the Physical scores by family size and number of children under 5 years of age.

	Main Sample				Prelim. Sample
	4 weeks	16 weeks	28 weeks	40 weeks	40 weeks
Sample Mean	63.4	55.2	49.8	70.7	69.9
Family Size					
1	63.9	55.7"	51.0*	71.2*	69.1
2	63.1	53.7	49.1	70.1	67.5
3	63.4	53.4	47.7	68.5	69.1
>3	62.8	51.1*	46.9*	67.8*	68.7
No. children < 5 years					
1	63.8	55.5*	50.8*	70.8	69.0
2	63.0	53.8	48.7	69.8	68.6
>2	63.2	50.4*	46.0*	67.5	67.5

TABLE LVI - Distribution of the mean values of Sit Walk scores by family size and number of children under 5 years of age.

	Main Sample			Prelim. Sample	
	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	41.3	43.8	44.2	43.6	43.8
Family Size					
1	42.1*	43.8	45.5*	44.4	46.2
2	49.1	44.8	45.2	41.7	42.1
3	47.7	41.9	41.6	44.2	43.4
>3	46.9*	42.2	41.4*	44.0	43.3
No. of children < 5 years					
1	42.1*	44.3	45.0	44.5	45.9*
2	41.0	44.3	44.3	43.3	42.3
>2	39.8*	41.6	41.6	41.6	39.3*

The distributions of the physical and Sit Walk scores by family size and number of children less than 5 years of age in the family are shown in Tables LV and LVI. A similar trend is apparent in the distributions of both scores at each age leve: the mean scores decreased as family size and the number of young children in the family increased. The relationship between the Physical scores and both family size and the number of young children in the family was significant at the 0.01 level at each age level from 16 to 40 weeks for the main sample. There was a similar tendency in the Physical scores of the preliminary sample but here the relationships were not statistically significant. The mean Sit Walk scores were also higher in the children from smaller families, in both the main and preliminary samples. The difference in mean score between first children and fourth and subsequent children was statistically significant at 28 and 52 weeks for the main sample ($p < .05$). In the main sample, if the survey child had no siblings aged less than 5 years, he was more likely to have a higher Sit Walk score at 28 weeks than if he had more than one young sibling ($p < .01$); in the preliminary sample, the relationship between the Sit Walk score and the number of young children in the family was statistically significant at the 52 week age level ($p < .01$).

TABLE LVII - Distribution of the mean values of the Hand Eye scores by family size and number of children under 5 years.

	4 weeks	16 weeks
Sample Means	31.7	28.7
Family Size		
1	32.2	29.0
2	31.2	28.7
3	31.9	28.3
> 3	31.5	28.1

(TABLE LVII ... Cont.)

	4 weeks	16 weeks
Sample Means	31.7	28.7
No. children < 5 years		
1	32.2	29.1*
2	31.3	28.6
> 2	31.4	27.7*

TABLE LVIII - Distribution of the mean values of the Table Top scores by family size and number of children under 5 years.

	Main Sample				Prelim. Sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Means	16.6	84.6	83.3	84.5	83.0	84.0
Family Size						
1	17.1*	87.2*	88.5*	87.7*	84.6*	85.5*
2	16.6	83.7	81.7	83.7	85.0	84.0
3	16.3	81.9	78.8	82.9	82.6	86.3
> 3	15.6*	82.4*	79.1*	79.9*	79.7*	80.3*
No. children < 5 years						
1	17.0*	87.2*	87.3*	86.5*	85.4*	86.2*
2	16.5	83.0	81.6*	83.4	82.2	83.4
> 2	15.4*	80.6*	77.0*	81.2*	76.8*	77.1*

The children from smaller families also obtained higher mean Hand Eye and Table Top scores (Tables LVII and LVIII). The distribution pattern of the Hand Eye scores was consistent but the only relationship which was statistically significant is that between the scores and the number of children in the family, aged less than 5 years, at the 16 week age level ($p<.05$). The relationship between the mean Table Top scores and family size was present at each age level studied; the difference in the values of the mean scores gained by first born children and those of the fourth and subsequent children was significant at the 0.01 level at each examination from 16 to 52 weeks in the main sample and at the 0.05 level of significance in the preliminary sample at 40 and 52 weeks. Children with no siblings aged less than 5 years tended to perform better on the Table Top tests, at each age level studied, than children with one or more young siblings; the mean difference in Table Top scores between the group of children with no young siblings and those with more than one, was statistically significant at each age level in both samples ($p<.01$ in each case).

TABLE LIX - Distribution of the mean values of the Social scores by family size and number of children under 5 years.

	Main Sample				Prelim. Sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Means	62.7	59.1	60.5	61.5	53.5	61.1
Family Size						
1	63.4*	60.5*	62.4*	63.6*	54.2	62.5*
2	62.5	58.5	59.8	60.7	53.0	61.2
3	62.4	57.9	58.4*	60.5	53.6	61.9
>3	61.6*	57.9*	59.4*	59.1*	53.0	59.1*
No. children <5 years						
1	63.4*	60.3*	62.0*	63.0*	54.2*	62.5*
2	62.3	58.3	59.8	60.8*	53.1	60.2
>2	61.6*	57.5*	58.2*	59.0*	52.1*	58.3*

The distribution of the mean Social scores by family size is similar to that of the Table Top scores: at each age level, first born children or those children who have no siblings under five years of age, obtained higher Social scores than the other children examined. The difference between the mean scores of these children and the mean scores of the children with more than two siblings or more than one sibling aged less than 5, was significant at the 0.01 level at each examination of the main sample from 16 to 52 weeks. In the preliminary sample, the difference between the mean scores of the children with no siblings under 5 and those with more than one sibling under 5 was also significant at the 0.01 level at both 40 and 52 weeks. There were no obvious trends in the distribution of mean Social scores by family size in this sample at 40 weeks but at 52 weeks the difference in mean score between first born and fourth or subsequent children was statistically significant ($p < .05$). This finding may reflect the less reliable history of their child's social development given by the mothers of the preliminary sample. The relationship between social development and the number of children aged less than five years in the family, appears to be strong enough to overcome this factor as a significant relationship was obtained on statistical testing.

These results indicate that first born children and children with no siblings aged less than 5 years are likely to develop the skills of hand eye co-ordination and gross movement earlier than other children and to perform better on developmental testing procedures during their first year of life. Family size is related to social class (Tables XLV and XLVI). It may be, therefore, that the apparent effect of family size on early development is a reflection of the social class effects already demonstrated. Neither factor can be considered in isolation; the environment provided for a child in any household will differ with the number and spacing of children in the family. It is possible that the effect of family size on the Social and Table Top scores obtained by the sample children is the result mainly of differences in family size by social class. When the Physical and Sit Walk scores are considered, family size appears to have a more marked effect than social class. First born children in the sample were more likely to have mothers from a higher social class; the tendency for these first born children to be advanced in sitting and walking development was sufficient to over-ride the trend for children with upper social class mothers to be slower in this aspect of development.

As social class and family size both appear to have an effect on early development, the effect of various obstetric factors was assessed separately on the group of children with no siblings under five years of age. 76 of the main sample and 50 of the preliminary sample were in this category. With the small samples of this study, it was not possible to make further subdivisions without arriving at groups too small for the adequate assessment of obstetric factors. By using these groups of children, the effects of the obstetric factors could be assessed without the complicating characteristic of birth rank, and as birth rank and social class are related, it was considered that the effect of social class differences might also be reduced.

MATERNAL AGE

Maternal age is associated with both social class and family size. In this study there was an excess of both the older (over 30) and younger (less than 20) mothers in the lower social classes. Parity rises with increasing maternal age. However, maternal age had no consistent effect on the Hand Eye, Physical or Social scores obtained by the children examined (Appendix 6). The children of the older mothers were more likely to have lower Sit Walk and Table Top scores than the rest of the sample from 28 weeks onwards; for both scores the relationship with maternal age was statistically significant at the 52 week age level in the main sample ($p < .05$). This may be the result of the strong relationship between family size and the Sit Walk and Table Top scores. The relationship between the Social scores and family size is also significant but, even so, no relationship was found between maternal age and Social scores. (Appendix 6).

MATERNAL HEIGHT

In this study, it was found that the mothers from the upper social classes were likely to be taller than those from the lower social class groups ($p < .01$). Despite this, there were no consistent relationships between maternal height and the Physical, Sit Walk, Hand Eye or Social scores. There was a tendency for the children of taller mothers to obtain higher Table Top scores and this relationship was statistically significant at the 40 and 52 week age levels ($p < .01$). It is possible that this trend is related to the strong relationship between social class and Table Top scores (Diagram 38).

As the maternal height was not known in 34% of the preliminary sample, the effect of this factor on the scores of the preliminary sample was not examined. The height of 16 mothers (10%) of the main sample was unknown; most of these mothers had had comparatively poor antenatal care. The mean Social and Table Top scores of the children of these 16 mothers were lower than those of the rest of the sample from the age of 28 weeks; the relationship was statistically significant ($p < .01$) for each Social score from 28 to 52 weeks and for the Table Top score at 40 weeks ($p < .05$).

THE EXAMINER'S ASSESSMENT OF THE CHILD AND THE FAMILY

The investigator attempted to obtain an assessment of each child of the main sample and his family, which would be independent of the social class grading of the family and of the child's performance on testing. These assessments could only be subjective and, on examination, they proved to be associated with the social class gradings (p.82): the children from the upper social class groups tended to have a more stimulating family environment with interested and caring fathers and siblings and their mothers were more likely to spend the optimum amount of time in caring for them.

The child's attitude to the examiner and the examination procedure was graded on a 9 point scale at the end of the study. The children from the upper social class groups were more likely to obtain the higher grades ($p<.05$). When the mean scores at each age group were calculated for the children by the grades awarded to them, the distribution of the mean scores indicated that the examiner had been influenced in her grading by the performance levels of the children (Appendix 6); the relationship between a high mean score and a high grading for the child's attitude was statistically significant ($p<.05$) for the Physical, Sit Walk, Table Top and Social scores at each age level studied and for the Hand Eye score at the 4 week age level.

The attitudes of the father and of any other children in the family to the survey child were assessed as good, average or jealous and the family assessed as stimulating, good, fair or poor in the environment provided for the child. The time which the mother spent in caring for and playing with the child was graded on a 10 point scale, with an optimum level of 10. When the scores obtained by the survey children were examined by these items, it was found that the children whose father and siblings had a good attitude towards them and who were being brought up in a stimulating family environment by a mother who spent the optimum amount of time in caring for them, were more likely to obtain higher scores at each age level in all the areas of development studied. The distribution of mean scores by these items will be found in Appendix 6.

This attempt to assess the child and family, without reference to his test performance and social class background did not prove successful. The most likely explanation of the strong relationship found, is that the investigator was influenced in her assessments by the performance levels of the children and her own social and environmental values.

OBSTETRIC FACTORS

The incidence and distribution of the complications of pregnancy and the perinatal period in this study have been described (P.95). It was observed that the complications studied were likely to occur in conjunction (Table XX). Multiple complications of labour and delivery and any complications of pregnancy were commoner in mothers who had had professional or secretarial training before marriage (Table XIX). Hyperemesis, toxaemia, bleeding in pregnancy, operative delivery and hazardous neonatal conditions were all more likely to occur in these mothers, particularly during their first pregnancy (Table XXII). It is difficult, therefore, to study the effect of any single obstetric factor; a significant relationship found between any one factor and developmental progress may be the effect of another related obstetric or social factor.

The relationship between developmental progress and family size and social class has been described. Where possible, the effect of the obstetric factors, used in the assessment of the sample as a whole, was noted also on the group of children who had no siblings aged less than 5 years. In this way, the effect of the variable of birth rank was reduced.

COMPLICATIONS OF PREGNANCY

Tables LX - LXIV list the mean scores obtained when the children were grouped by complications of pregnancy. The complications included were bleeding in pregnancy, hyperemesis gravidarum, pre-eclamptic Toxaemia, intercurrent infections, the occurrence of persistent glycosuria, albuminuria or bacilluria and any special procedures performed during pregnancy, for example the insertion of a Shirodkar suture.

TABLE LX - Distribution of the mean Physical scores by the incidence of pregnancy complications.

No. of Complic.	Main Sample 4 weeks	16 weeks	28 weeks	40 weeks	Prelim. Sample 40 weeks
Total Sample					
Sample Mean	63.4	54.0	49.2	69.8	68.6
None	63.5	54.1	49.2	69.9	68.4
1	62.3	54.0	49.7	69.9	68.8
>1	65.1	53.2	47.9	69.4	71.0
Children with no sibs. < 5					
Group Mean	63.8	55.5	50.8	70.8	69.0
None	64.1	56.0	51.2	70.5	68.8
1	62.9	55.0	50.6	71.5	69.4
>1	64.7	54.6	49.4	70.7	

TABLE LXI - Distribution of mean Sit Walk scores by the incidence of complications of pregnancy.

No. of Complic.	Main Sample 28 weeks	Main Sample 40 weeks	Main Sample 52 weeks	Prelim. Sample 40 weeks	Prelim. Sample 52 weeks
Total Sample					
Sample Mean	41.3	43.8	44.2	43.6	43.8
None	41.4	43.8	44.0	43.4	43.4
1	41.6	44.9	45.5	43.4	43.1
>1	39.9	41.0	42.3	47.5	49.8
Children with no sibs. <5 yr.					
Group Mean	42.1	44.3	45.0	44.5	45.9
None	42.3	44.0	44.2	44.6	45.8
1	42.4	45.6	47.0	44.4	46.0
>1	40.2	42.7	44.7		

No significant relationships were detected between the Physical or Hand Eye scores and the incidence of complications in pregnancy (Tables LX and LXI). Until 28 weeks, there was a tendency for the children who were born after a pregnancy where two or more complications had occurred to have lower Physical and Sit Walk scores but this was not significant. The distributionof the mean scores of the children who had no siblings aged less than 5 years was similar to that of the samples as a whole. Only 5 children in the preliminary sample were born after pregnancies where there were two or more known complications and so there were too few children in this group to sub-divide the complications group for the children with no young siblings in the preliminary sample. It is possible that there was under-recording of pregnancy complications in the preliminary sample.

TABLE LXII - Distribution of the mean values of the Hand Eye scores by the incidence of complications of pregnancy.

No. of Complications	Main Sample 4 weeks	16 weeks
Total Sample		
Sample mean	31.7	28.7
None	31.9	28.6
1	31.5	29.0
>1	31.2	28.6
Children with no sibs. <5 yr.		
Group Mean	32.2	29.1
None	32.3	29.0
1	32.2	29.4
>1	31.9	29.3

TABLE LXIII - Distribution of the mean values of the Table Top scores by the incidence of complications of pregnancy.

No. of Complic.	Main Sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim. Sample 40 weeks	52 weeks
Total Sample						
Sample Mean	16.6	84.6	83.3	84,5	83.0	84.0
None	16.6	84.6	83.0	84.3	82.6	83.5
1	16.7	84.3	83.3	84.9	84.8	85.2
>1	16.2	85.2	85.5	84.6	82.7	84.6
Children with no sibs. < 5 years.						
Group Mean	17.0	87.2	87.3	86.5	85.4	86.2
None	17.2*	87.3	87.6	86.9	86.2	86.1
1	17.1	84.3	86.3	86.3	} 84.0	} 86.3
>1	16.1*	85.2	88.5	85.1		

There was a tendency for children who had been born after complications of pregnancy to have a lower mean Hand Eye score at 4 weeks and a lower mean Table Top score at 16 weeks; the difference inmean Table Top score at 16 weeks between the children with no young siblings who had been born after complicated pregnancies and the rest of this group was statistically significant ($p < .05$). From 28 weeks no trends were apparent in the distribution of these scores and there were no statistically significant relationships.

TABLE LXIV - Distribution of the mean values of the Social scores by the incidence of complications of pregnancy.

No. of Complic	Main Sample 16 weeks	Main Sample 28 weeks	Main Sample 40 weeks	Main Sample 52 weeks	Prelim. Sample 40 weeks	Prelim. Sample 52 weeks
Total Sample						
Sample Means	62.7	59.1	60.5	61.5	53.5	61.1
None	62.6	58.8	60.4	61.2	53.4	61.0
1	62.8	59.8	60.4	62.2	53.6	60.9
>1	62.7	59.7	61.3	61.8	54.6	62.1
Children with no sibs. < 5 yr.						
Group Means	63.4	60.3	62.0	63.0	54.2	62.5
None	63.3	59.9	62.0	63.0	53.6	62.4
1	63.6	61.0	61.4	63.3	55.2	62.6
>1	63.1	60.8	63.1	62.1		

There is little difference in the mean values of the Social scores at any age level and there were no consistent patterns in their distribution.

In this study, the occurrence of complications of pregnancy seems to have had little effect on the early development of the children born after these pregnancies. The children born after a pregnancy where two or more complications occurred may have been a little slower in the development of hand eye co-ordination and physical skills during the first few months of life but there was no evidence that this effect remained after the age of 16 weeks.

COMPLICATIONS OF LABOUR AND DELIVERY

Tables LXV - LXIX list the mean scores obtained when the children were grouped by complications of labour and delivery. The items included in this category were induction of labour, complications of the mother or child arising during labour (for example, uterine inertia in the mother or foetal distress in the child), a second stage of labour lasting more than two hours, delivery by any means other than spontaneous vertex delivery, and the birth of an asphyxiated child, described as"limp" or with an Apgar score of 6 or less and in need of active resuscitation.

TABLE LXV - Distribution of the mean values of the Physical scores by the incidence of complications of labour and delivery.

No. of Complic.	Main Sample 4 weeks	16 weeks	28 weeks	40 weeks	Prelim. Sample 40 weeks
Total Sample					
Sample Means	63.4	54.0	49.2	69.8	68.6
None	63.0	52.6	47.5*	69.4	68.5
1 or 2	63.6	55.0	49.6	69.8	68.3
> 2	63.5	54.2	50.8*	70.7	69.2
Children with no sibs. < 5 yr.					
Group Mean	63.8	55.5	50.8	70.8	69.0
None	63.8	55.7	50.3	71.1	68.3
1 or 2	63.6	55.8	51.3	71.1	69.0
> 2	63.5	55.2	50.5	70.5	69.6

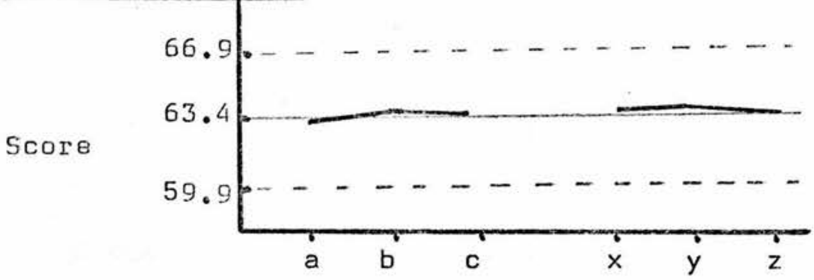
TABLE LXVI - Distribution of the mean values of the Sit Walk scores by the incidence of complications of labour and delivery.

No. of Complic.	Main Sample 28 weeks	40 weeks	52 weeks	Prelim. Sample 40 weeks	52 weeks
Total Sample					
Sample Mean	41.3	43.8	44.2	43.6	43.8
None	40.6	42.7	42.6	44.2	43.7
1 or 2	41.7	44.6	44.9	42.9	43.7
> 2	41.6	44.1	45.3	44.4	44.2
Children with no sibs. < 5 yr.					
Group Mean	42.1	44.3	45.0	44.5	45.9
None	42.9	44.4	44.2	43.9	44.3
1 or 2	42.7	45.3	46.0	45.8	49.5
> 2	41.3	43.3	44.6	44.3	45.0

The mean Physical and Sit Walk scores of the preliminary sample showed no consistent trends when examined by the incidence of complications of labour and delivery. When the distributions of these mean scores for the main samples were considered, a tendency for the children born after a complicated labour and delivery to obtain higher scores than the children born after an uncomplicated labour and delivery was observed; this pattern occurred at each age level for both scores and the difference between the mean values of the Physical score of the main sample group who were born after an uncomplicated delivery and those born after a labour and delivery where more than two complications occurred, was statistically significant at the 28 week examination ($p < .01$). For both scores at each age level, when the distribution of the mean scores of the children who had no young siblings was examined, this trend was reduced or reversed.(Diagrams 40 &41)

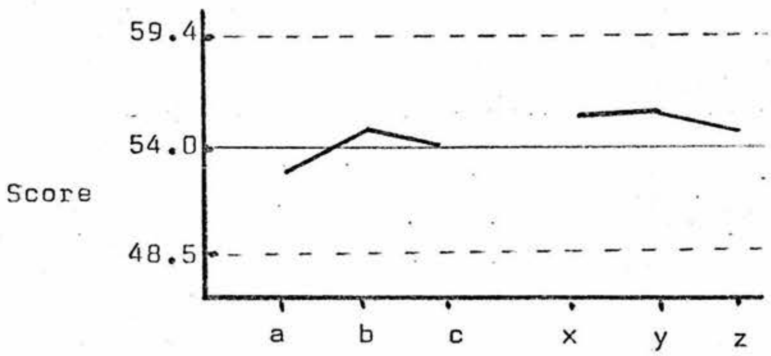
DIAGRAM 40. Distribution of the mean values of the Physical scores of the main sample and of the children of the main sample with no young siblings, by the incidence of complications of labour and delivery at the 4, 16, 28 and 40 week age levels.

4 week age level.

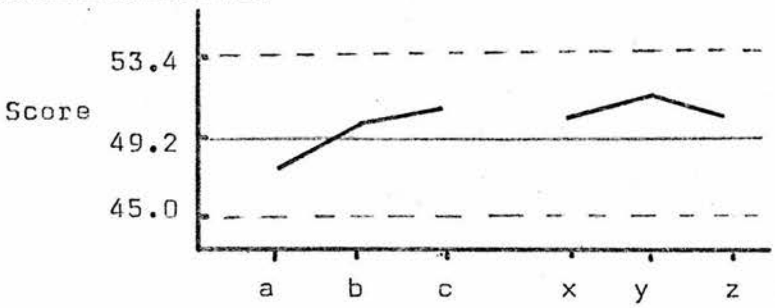


KEY for
Diagrams 40 - 44.
Main sample
a - No complic.
b - 1 or 2 comp.
c - > 2 complic.
Children with no
siblings < 5 yr.
x - No complic.
y - 1 or 2 comp.
z - > 2 complic.

16 week age level.



28 week age level.



40 week age level.

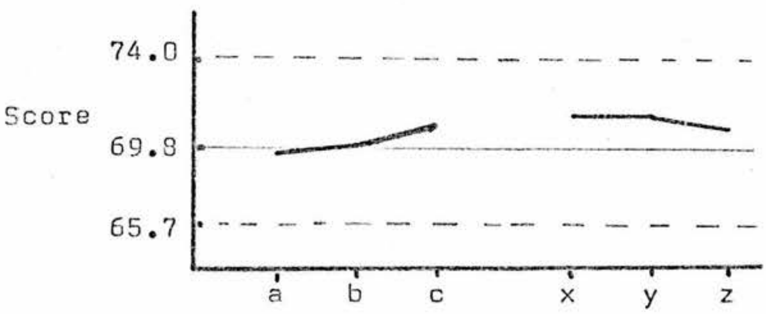
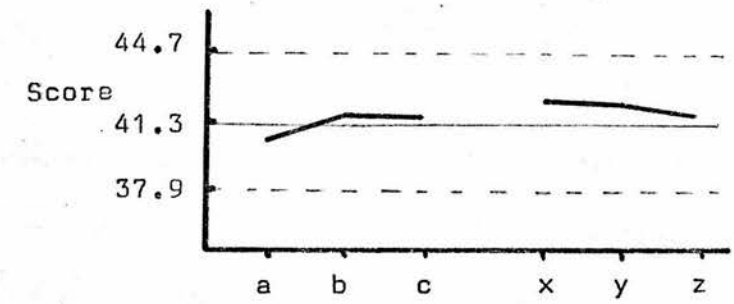
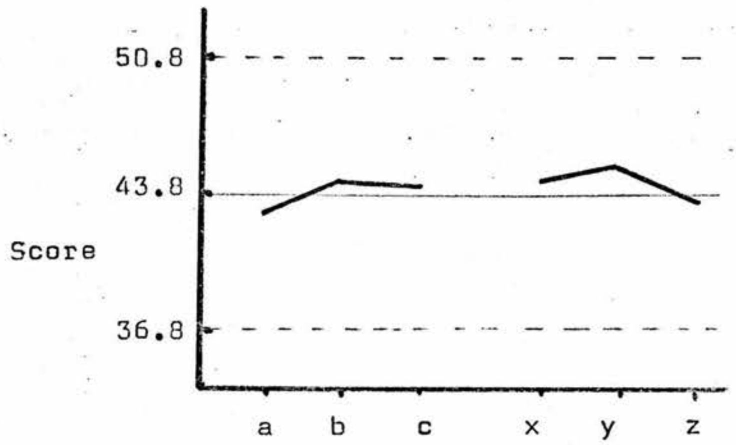


DIAGRAM 41. Distribution of the mean values of the Sit Walk scores of the main sample and of the children of the main sample with no young siblings, by the incidence of complications of labour and delivery at the 28, 40 and 52 week age levels.

28 week age level.



40 week age level.



52 week age level.

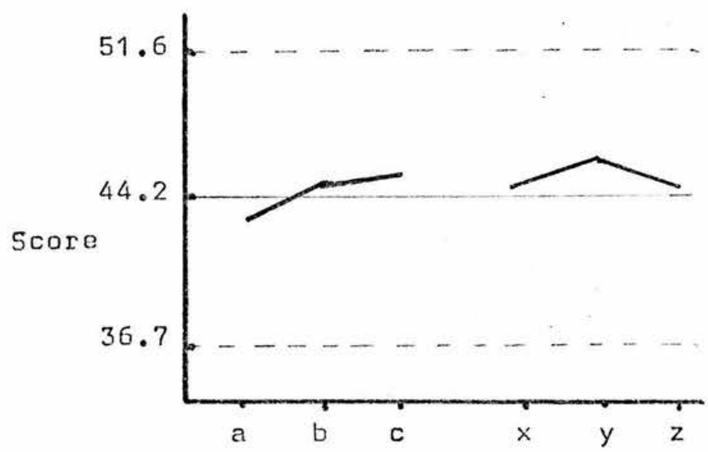


TABLE LXVII - Distribution of the mean values of the Hand Eye scores by the incidence of complications of labour and delivery.

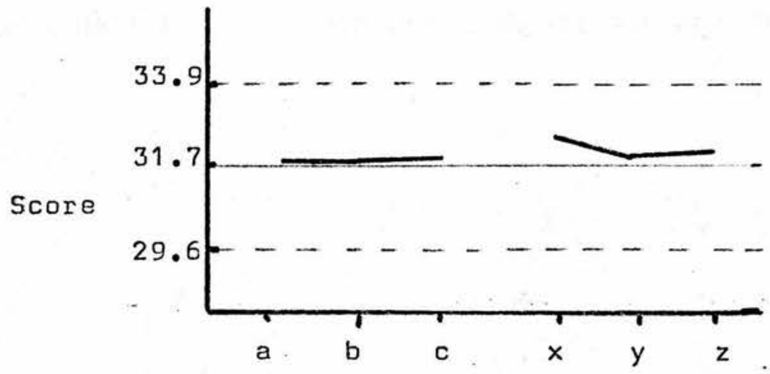
No. of complications	Main Sample 4 weeks	16 weeks
Total Sample		
Sample Mean	31.7	28.7
None	31.8	28.3
1 or 2	31.7	29.0
> 2	31.8	28.8
Children with no sibs. < 5 yr.		
Group Mean	32.2	29.1
None	33.0	28.9
1 or 2	32.0	29.0
> 2	32.2	29.3

TABLE LXVIII - Distribution of the mean values of the Table Top scores by the incidence of complications of labour and delivery

No. of Complic.	Main Sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim. Sample 40 weeks	52 weeks
Total Sample						
Sample Mean	16.6	84.6	83.3	84.5	83.0	84.0
None	16.3	82.6*	79.9*	81.5*	82.4	83.7
1 or 2	16.8	84.8*	84.2*	85.0*	81.5	82.7
> 2	16.7	86.9*	87.0*	87.7*	85.4	85.7
Children with no sibs. < 5 yr.						
Group Mean	17.0	87.2	87.3	86.5	85.4	86.2
None	17.1	86.7	87.2	83.2*	86.8	85.4
1 or 2	17.0	87.2	87.3	87.2	84.8	85.8
> 2	17.0	87.4	87.5	87.4*	84.9	87.1

DIAGRAM 42. Distribution of the mean values of the Hand Eye scores of the main sample and of the children of the main sample with no young siblings, by the incidence of complications of labour and delivery at the 4 and 16 week age levels.

4 week age level.



16 week age level.

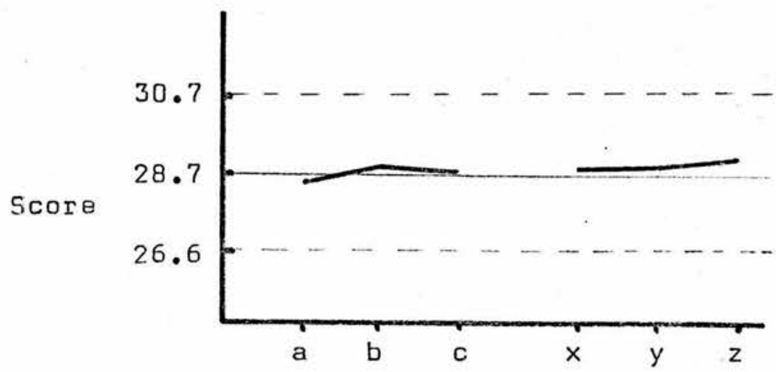
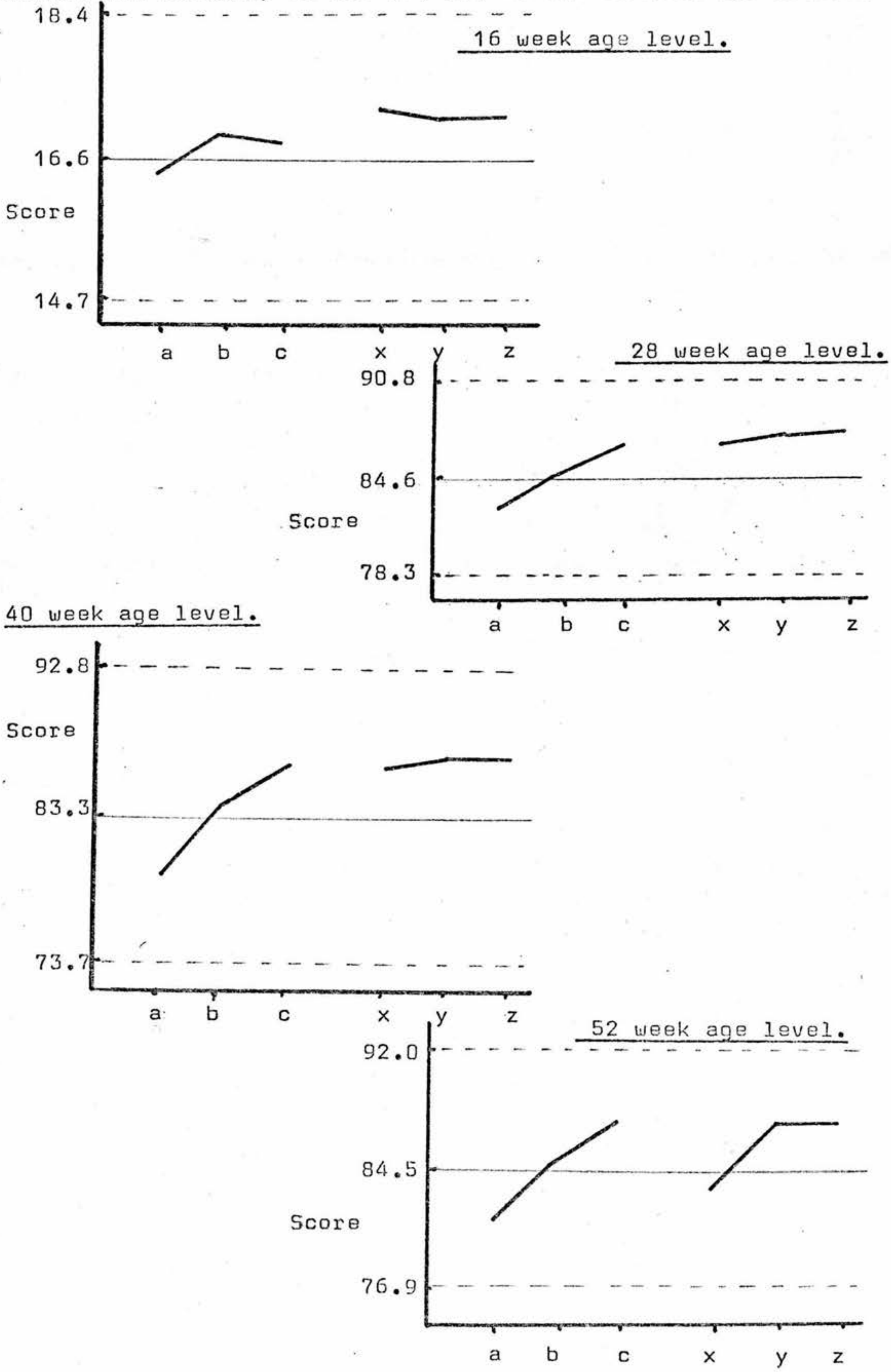


DIAGRAM 43. Distribution of the mean values of the Table Top scores of the main sample and of the children of the main sample with no young siblings, by the incidence of complications of labour and delivery at the 16, 28, 40 and 52 week age levels.



Little difference was found in the values of the mean Hand Eye scores obtained when the scores were examined by the incidence of complications of labour and delivery. (Table LXVII and Diagram 42). However, the occurrence of complications of labour and delivery appeared to increase the level of Table Top score obtained during the first year of life (Table LXVIII and Diagram 43); this relationship was statistically significant at each age level from 28 to 52 weeks for the main sample ($p < .01$). When the mean scores of the group of children with no siblings under the age of 5 were considered, the trend of the total group for scores to increase with an increasing number of complications was not seen until the 52 week age level when it was present, but reduced in extent ($p < .05$).

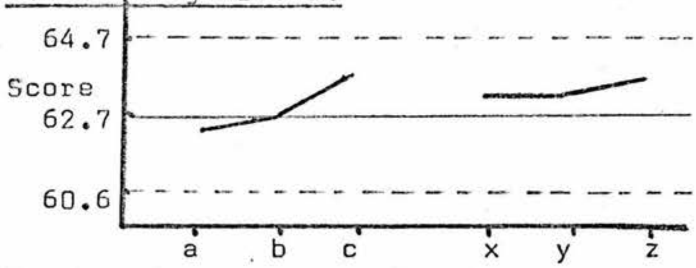
TABLE LXIX - Distribution of the mean values of the Social Scores by the incidence of complications of labour and delivery.

No. of Complic.	Main Sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim. Sample 40 weeks	52 weeks
Total Sample						
Sample Mean	62.7	59.1	60.5	61.5	53.5	61.1
None	62.3	58.6*	59.3*	59.8*	53.2	60.4
1 or 2	62.7	58.9	60.7*	62.2*	52.9	61.4
> 2	63.6	60.2*	61.8*	62.9*	54.5	62.1
Children with no sibs. < 5 yr.						
Group Mean	63.4	60.3	62.0	63.0	54.2	62.5
None	63.3	60.4	61.6	62.8	54.7	62.5
1 or 2	63.2	59.9	61.6	63.5	52.2	62.5
> 2	63.6	60.6	62.5	61.7	54.8	62.5

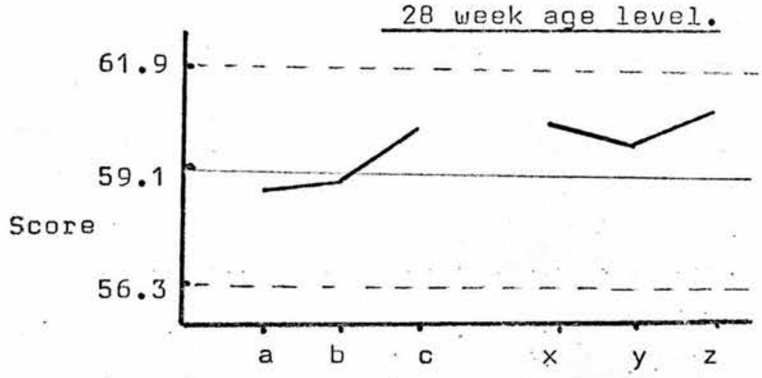
The distribution of the mean values of the Social score by the incidence of complications of labour and delivery is similar to that of the Table Top scores (Table LXIX and Diagram 44). The children

DIAGRAM 44. Distribution of the mean values of the Social scores of the main sample and of the children of the main sample with no young siblings, by the incidence of complications of labour and delivery at the 16, 28, 40 and 52 week age levels.

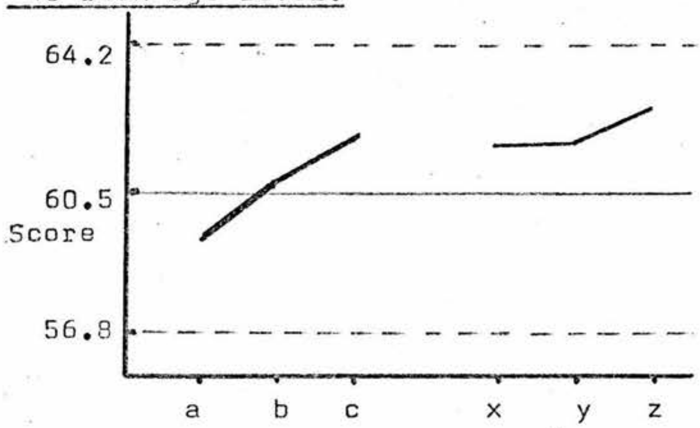
16 week age level.



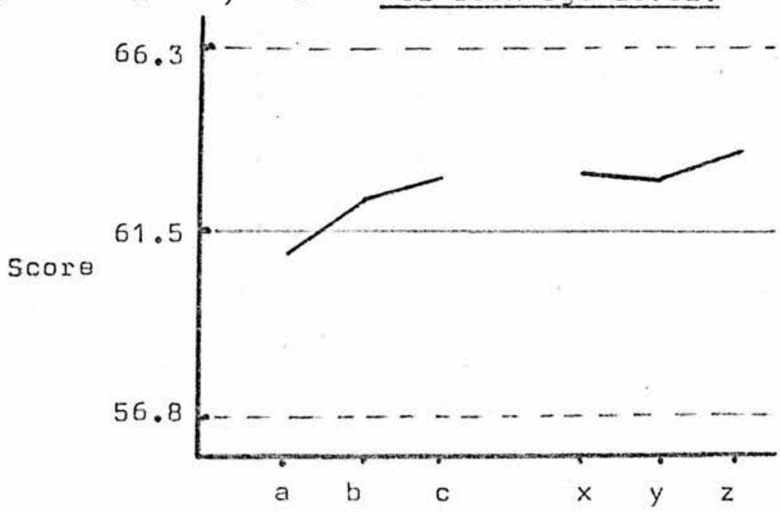
28 week age level.



40 week age level.



52 week age level.



born after complicated labours obtained higher Social scores than those born after uncomplicated labours; this relationship was present at each age level in both samples and was statistically significant for the main sample at 28, 40 and 52 weeks ($p<.01$). However, when the group of children who had no siblings under the age of 5 were considered, there was no relationship between the incidence of the complications of labour and delivery and Social development during the first year of life; there was little difference in the mean values of the scores for each group.

When the development of these two samples of normal children during the first year of life was examined by their exposure to complications of labour and delivery, the children who were born after a complicated labour appeared to perform better on developmental tests, particularly the Social and Table Top tests, than the children born after an uncomplicated labour. The influence of social class and birth order on developmental progress has been shown (pp.226-249). It has been demonstrated that perinatal complications occurred more frequently in the mothers from the upper social class groups, particularly during their first pregnancy. The apparent beneficial effect of perinatal complications on development may be explained by this relationship. When the effect of complications of labour and delivery on the mean scores of the children who had no siblings under 5 years of age was considered, little difference in the mean developmental scores obtained by the children born after complicated or uncomplicated labour was observed: a significant relationship was found in only one instance, the Table Top score at 52 weeks, and here the relationship was less marked than that for the entire sample. By reducing the effects of birth order, in this way, it was possible to demonstrate that complications of labour and delivery did not produce higher developmental scores during the first year of life. With a larger sample, it might be possible to standardise adequately for both social class and birth order and so obtain a more reliable assessment of the effects of complications of labour and delivery on developmental progress in the first year of life.

COMPLICATIONS DURING THE FIRST TEN DAYS OF LIFE

Tables LXX - LXXIV list the mean scores obtained when the children were grouped by the presence of complications during the first ten days of life. The information available for this period on the preliminary sample was incomplete and so this assessment was performed on the main sample only. The complications included in this category were those which were present outside the immediate neonatal period, namely the results of mechanical birth injury, jaundice, respiratory complications, biochemical or haematological disorders, hypothermia, or infections other than superficial, occurring during the first ten days of life.

TABLE LXX - Distribution of the mean values of the Physical scores by the incidence of complications during the first ten days of life.

	Main Sample			
	4 weeks	16 weeks	28 weeks	40 weeks
Total Sample				
Sample Mean	63.4	54.0	49.2	69.8
No complications	63.6	54.0	49.3	69.7
Any complications	62.3	53.8	48.9	71.0
Children with no sibs. <5 yr.				
Group Mean	63.8	55.5	50.8	70.8
No complications	63.9	55.5	51.1	70.9
Any complications	63.6	55.9	49.5	70.6

TABLE LXXI - Distribution of mean values of Sit Walk scores by the incidence of complications during the first ten days of life.

	Main Sample 28 weeks	40 weeks	52 weeks
Total sample			
Sample Mean	41.3	43.8	44.2
No complications	41.4	43.6	44.0
Any Complications	40.5	45.7	45.5
Children with no sibs. < 5 yr.			
Group Mean	42.1	44.3	45.0
No complications	42.5	44.3	44.9
Any complications	40.3	44.5	45.8

The mean Physical and Sit Walk scores obtained by the children who had had complications during their first 10 days of life were similar to those of the rest of the sample. From 40 weeks, those who had had some complication appeared to have slightly higher scores than the rest of the sample; this trend was not statistically significant and was reduced when the effect of these neonatal complications on the development of the children who had no siblings aged less than 5 years was considered.

TABLE LXXII - Distribution of the mean values of the Hand Eye scores by the incidence of complications during the first ten days of life.

	Main Sample	
	4 weeks	16 weeks
Total Sample		
Sample Mean	31.7	28.7
No complications	31.8	28.8
Any complications	31.4	28.0
Children with no sibs. $<$ 5 yr.		
Group Mean	32.2	29.1
No complications	32.3	29.0
Any complications	31.8	29.0

TABLE LXXIII - Distribution of the mean values of the Table Top scores by the incidence of complications during the first ten days of life.

	Main Sample			
	16 weeks	28 weeks	40 weeks	52 weeks
Total Sample				
Sample Mean	16.6	84.6	83.3	84.5
No complications	16.6	84.2	83.0	84.3
Any complications	16.0	86.9	85.4	86.0
Children with no sibs. $<$ 5 yr.				
Group Mean	17.0	87.2	87.3	86.5
No complications	17.2	87.0	87.4	86.8
Any complications	16.4	88.3	86.7	85.5

The distribution of the mean Hand Eye and Table Top scores by the presence of complications during the first ten days of life is similar to that of the Physical and Sit Walk scores. There were no statistically significant relationships but there was a slight tendency for those children who had suffered these neonatal complications to obtain higher Table Top scores from the age of 28 weeks; this trend was not apparent when only those children who had no sibs under 5 years of age were considered.

TABLE LXXIV - Distribution of the mean values of the Social scores by the incidence of complications during the first ten days of life.

Main Sample

	16 weeks	28 weeks	40 weeks	52 weeks
Total Sample				
Sample Mean	62.7	59.1	60.5	61.5
No complications	62.8	59.0	60.4	61.5
Any complications	62.7	59.5	60.9	61.4
Children with no sibs. $<$ 5 yr.				
Group Mean	63.4	60.3	62.0	63.0
No complications	63.3	60.2	62.0	62.8
Any complications	63.6	60.2	62.0	62.8

There was little difference in the values of the mean Social scores obtained by the children who had complications during their first ten days of life and those obtained by the rest of the sample.

From these results, it would appear that in these samples the occurrence of the neonatal complications studied has little effect on the development of the child during the first year of life. The highest incidence of these neonatal complications was in the lowest social class group, by paternal social class gradings. It is likely therefore, that the social class influence on development would accentuate any deleterious effect of these complications. As there is no evidence of this, it may be that these neonatal complications have no detectable influence on early developmental progress.

INDIVIDUAL OBSTETRIC FACTORS

It was possible to examine the effects of some of the complications of pregnancy and the perinatal period individually. The complications which had occurred frequently enough to allow this were: toxaemia, induction of labour, complications arising in the child or in the mother during labour, a second stage of labour which lasted longer than 2 hours, and delivery other than spontaneous vertex delivery. The distributions of the mean values of the developmental scores by these individual factors are given in the tables of Appendix 6. With each factor studied, it was found that the mean values of the developmental scores of the children who had been born after the occurrence of a complication of pregnancy and labour, were higher than those of the children born after an uncomplicated pregnancy and delivery; this trend was most marked in the Social and Table Top scores and the statistically significant items are indicated in the tables. The patterns were similar to that of the distribution of mean scores by the incidence of all complications of labour and delivery (Tables LXV - LXIX and Diagrams 40 - 44). In each case, if the effect of the complication on the mean developmental scores of the group of children with no sibs under 5 years of age, was considered, either there was little difference in the mean values observed or the apparent beneficial effect of the complications on the scores was reduced.

The relationship between the drugs given to the mother and the developmental scores of the children was also investigated. The groups considered were those where no medication was given, those who received analgesics, with or without local anaesthesia, those who had analgesics and spinal anaesthesia and those who had a general anaesthetic. No statistically significant relationships or consistent distribution patterns were found when the total samples or the group of children with no young siblings were considered. (Appendix 6.)

There were no statistically significant relationships between the level of the Apgar count at one or two minutes after birth and the developmental scores of the children of the main sample (Appendix 6) It was thought that the care of the child during the first 48 hours of life might form a good index of the level of asphyxia at birth. The children were divided into four categories: those who had not required active resuscitation at birth and who did not need special nursing care during the first 48 hours of life, those who did not need special nursing care but had required active resuscitation at birth, those who had not needed active resuscitation at birth but were cot-nursed or nursed in an incubator during the first 48 hours of life and those who had required both active resuscitation at birth and special care for the first 48 hours of life. The distribution of mean values of the developmental scores by these groupings showed no consistent patterns or statistically significant relationships (Appendix 6).

SEX, BIRTH WEIGHT AND LENGTH OF GESTATION

The distributions of the mean values of the developmental scores by the sex of the children, their birth weight and their length of gestation were also considered (Appendix 6). The mean values of the developmental scores obtained by the male and female children were similar for each score at every age level and no statistically significant relationships were detected.

Children whose birth weight was $4\frac{1}{2}$ pounds or less, or who were born after a gestation period of less than 36 weeks were excluded from the main sample. Even so, when the children of this sample were grouped by birth weight, it was found that the children of lower birth weight (less than 6lb 9 oz.) were more likely to have low Physical and Hand Eye scores at 4 and 16 weeks ($p < .05$). These children also had a lower mean Sit Walk score at 28 weeks ($p < .05$) and tended to lag slightly in their sitting and walking development until at least the 52 week age level. There were no consistent distribution patterns for the Table top scores but the children of lower birth weight had lower mean Social scores at each age level; the relationship was statistically significant at the 16 week examination ($p < .05$);

The children born after less than 39 weeks gestation had a lower mean Hand Eye score at the 4 week age level ($p < .05$) but no consistent pattern was observed in the distribution of the mean scores at any other age level.

It appears from these findings that, even when children of very low birth weight and gestation are excluded, birth weight and length of gestation may affect the development, particularly the physical development, of a child until the 28 week age level and possibly until one year of age.

The findings in this study indicate that parental social class and family size are important determinants of the developmental progress of a child during his first year of life, the effect of these factors appears to be strong enough to obscure any effect on the child's early development of complications occurring during the pregnancy or perinatal period.

The samples used in this study were too small to allow the effective use of analysis of variance procedures to assess the relative importance of the various factors involved. It would appear that obstetric complications had a relatively unimportant effect on the developmental progress of these normal Glasgow children during their first year of life.

DISCUSSION

Before the introduction of the sulphonamides in 1935, the main cause of infant mortality was infection, usually after the neonatal period; neonatal mortality now accounts for more than two-thirds of the deaths in the first year of life. With the improved standards of obstetric care, both neonatal deaths and stillbirths have been reduced and by 1967, the perinatal mortality rate in Scotland was 27.5 per 1000 total births, less than half the rate in 1939 (Baird and Thomson, 1969). It is possible now to go beyond the mortality statistics and to consider the quality of the lives preserved. By the study of the developmental processes of normal children and the factors influencing them, knowledge may be obtained which could indicate the way in which the quality of child life and health might be improved at both the individual and the community level.

THE CHILD AS AN INDIVIDUAL

The individual child may be helped if the presence of any handicapping conditions which may need special care and attention, can be detected early in life. In examinations for this purpose, one of the many available developmental schedules is normally used. Unfortunately, there is little agreement between these schedules on the usual age of achievement of common skills, and some schedules show internal inconsistencies. The performance, during their first year of life, of two samples of normal Glasgow children on three such schedules has been described (pp137-159); the schedules used for this assessment were the Developmental Screening Inventory (Knobloch et al., 1966), Illingworth's outline of developmental progress (Illingworth, 1962) and the Stycar chart (Sheridan, 1971). These schedules would not have provided a reliable assessment of the developmental progress of these two samples of children, if used as described by the authors, until the children reached the age of 52 weeks. Even at that age level, the Developmental Screening Inventory and Illingworth's outline of developmental progress would have been of little practical value as they both describe the performance expected of the 'average' child and give no indication of the normal range of achievements. Sheridan's Stycar chart describes the usual behaviour expected of a normal child at the given age levels and she suggest that a child can be considered to be within normal limits if he performs a minimum of two-thirds of the items listed at his chronological age level. As children's behaviour can vary from day to day, this would appear to be a more satisfactory type of schedule for routine use. In its present form, however, it too gives no indication of the normal range of development and is an imprecise tool in the hands of other than a very experienced examiner.

Over the last few years, it has become widely accepted that all children should have periodic developmental screening tests at say, 6 weeks, 6 months and 10 months and possibly annually till 5 years of age (British Medical Journal, 1971) This emphasis on the assessments during the first year of life is based on the assumption that early developmental scores and quotients are of value as predictors of later developmental and intelligence levels; this use of developmental testing has been investigated by many workers.

Illingworth (1960) points out that, during the first year of life, developmental assessments are more likely to under-estimate than to over-estimate a child's ability. Development does not proceed steadily; a temporary lull in one or more aspects of development may be followed by a sudden developmental spurt which brings the child up to the normal levels. Despite this, Illingworth considers that it is usually possible to detect those children who are mentally subnormal during their first year of life (1959 and 1971). The evidence available in the literature on the prediction of later intelligence levels from infant test results was reviewed recently by Rutter (1970); he concluded that the level of prediction from assessments at or before 6 months of age was very poor. At 6 months, pathological conditions can usually be detected but an appreciable number are still misdiagnosed. Yang and her colleagues (1968) compared the results of assessments in the neonatal period and at one year of a group of 4 year old retarded children with those of a matched control group of children with normal intelligence. They commented that, although the neonatal examination could not be expected to detect subtle defects of cortical dysfunction which had become apparent by the age of 4 years, the inability of the one-year examination to detect the probability of retardation in some of the cases studied was unexpected.

In the English and Swedish sections of the International Study of Child Development, it was observed that, although there was a statistically significant relationship between the developmental scores of the sample children during the first year of life and later test results, this was of little practical value in the prediction of the future performance levels of individual children. (Hindley, 1960; Klackenberg-Larsson and Stensson, 1968) American workers have also observed that a good statistical relationship between early developmental scores and later intelligence test results may be of no practical value (Ireton et al., 1970; Gannon, 1968; Jordan and Spanner, 1970; Willerman and Bremen, 1970).

In this study, three main sets of developmental scores were calculated for each child at each age level, the Total Physical score, the Total Hand Eye score and the Social score. The correlation matrices for each set of scores at the five age levels studied showed a statistically significant relationship for each aspect of development between the scores obtained at each age level (Tables XXXV-XXXVIII). In common with the other studies quoted this was observed to be of little practical value; no more than 2 of the 12 children who had scores below the 10th percentile in any of the aspects of development at the 16 week examination, remained below this percentile level at all the subsequent examinations. At the top end of the scale, only one of the 12 children with scores above the 90th percentile at the 16 week examination, remained at this level until the 52 week examination.

It has been suggested that the prediction of subsequent levels of performance from infant test results is more reliable for those children who are likely to be of low intelligence (Knobloch and Pasamanick, 1960; Werner et al., 1968b). Even so, a single assessment is of little use either for the detection of other than gross abnormality at that stage in the child's development or for the prediction of his future ability. A minimum of two examinations is required, at an interval of perhaps one month, to allow an estimate to be made of the rate of developmental progress of the child. The range of normal ability at each age level is wide and, unless a child is exceptionally slow or exceptionally advanced in his development, the assurance that he is "normal" can be given only after it has been observed that his rate of development is also within the limits of normality.

Developmental assessments are time consuming and a recent paper suggests that a full developmental examination may not be necessary as a screening procedure (Roberts and Khosla, 1972). The authors found that developmental testing procedures did not prove to be efficient in the detection of visual or auditory defects during the first year of life but they considered that an examination of gross and fine motor function only is as efficient in the detection of neurological defects as the full Gesell testing procedure containing test items for all five areas of development; namely, gross motor, fine motor, adaptive, language and personal social behaviour. They found a high degree of correlation between the scores obtained by 193 children, aged 11 to 13 months, in these five areas of development. The scores used in the present study are not strictly comparable with those obtained on the Gesell tests. The Total Physical score is equivalent to the Gesell subgroup of gross motor function but the Total Hand Eye score contains items from the fine motor and adaptive subgroups and the Social score includes items similar to those of Gesell's language and personal social subgroups. The correlation matrices for these scores at each age level are given in Appendix 7. They indicate that in this study, with the exception of the 40 week examination of the preliminary sample, there is also a statistically significant relationship between the scores obtained in each area of development by the children studied at each age level. This relationship was examined further by noting the percentile placing of those children whose scores fell below the 10th or above the 90th percentile in any area of development for each age level. At the 28 week examination, 153 children were examined and so there were 15 children who had scores below the 10th percentile. Only 5 children had scores below the 10th percentile in all three areas of development and 4 other children had scores below the 10th percentile in two of the three areas of development at this age level. At each of the other four age levels, an even smaller number of children had scores below the 10th percentile level in more than one aspect of development. At no age level were there any more than two children with scores above the 90th percentile in all three aspects of development. It would appear, therefore, that as with the predictive use of developmental scores, the existence of a statistically significant relationship does not necessarily indicate that this relationship is of any practical value for the individual child.

There is little practical use in the identification of children of above average ability at an early stage in their development. If such children are brought up in a poor environment, with inadequate food and clothing and little or no stimulation, they may not attain their full potential but, even so, it is probable that they will be able to obtain sufficient eduction and training to enable them to function at a reasonable level in their adult life. In an ideal situation, the ideal environment might be provided for them but this is not practicable in our society today.

Where a child has a handicapping condition which can be cured or alleviated by treatment or the use of artificial aids, it is desirable that the presence of such a handicap should be detected early in his life to enable any necessary treatment to be given at the optimum time. Similarly, a child with severe developmental retardation may possibly benefit from early detection of his condition so that remedial care can begin at the earliest practicable time. Even where treatment can produce little change in the prognosis of a severely handicapped or retarded child, early detection of these conditions will enable help to be provided for the family before the problem has become too much for them; adequate supervision and assistance where necessary can do much to alleviate the parents' burden in such cases. The developmental tests and schedules available today, combined with routine paediatric physical examination, appear to be effective in the early detection of such severe defects.

There is considerable evidence that, of the children who do not perform well on infant testing, those from good environments tend to improve on testing in later years whereas those from a poorer background both financially or culturally, seem to continue to function at a low level or even to deteriorate (Eaves et al., 1970; Werner et al, 1968). It would seem, therefore, that if the environment of such children could be enriched from early childhood, they may be able, in later life, to use their limited abilities to their fullest extent and so obtain a better quality of life. Recently, there has been an attempt to provide additional nursery and playgroup facilities in the "twilight" zones of British cities; this is not enough. The children need to be helped before they reach the age where they can attend play groups: it is necessary to educate the parents so that they can improve the environment in which the child spends most of his life.

The first step in such a scheme is the identification of the children at risk; such children could be at risk not because of obstetric and other medical hazards, but because a poor environment combined with a possibly below average endowment of "intelligence" can produce a socially disadvantaged adult. The children are probably not markedly retarded but merely at the lower limits of the normal range. At present, there is little information available on the process of normal development or the range of development which may be accepted as normal in British children, and so the detection of such children at an early stage in their life is exceedingly difficult, if not impossible. There are regional and national variations in developmental levels (Davis, 1972; Hindley, 1968) and the results of this study indicates that there are also considerable differences in developmental levels associated with social class and family size. The only really valuable developmental schedule for widespread use on British children would be one produced from a prospective survey of normal development, undertaken simultaneously in a large number of centres on representative samples of normal children. This would be a mammoth task and no useful information from such work could be available until several years after it began. Despite this, such a project would be of great value, particularly if the results obtained could be presented in an easily understood and practicable format. For such a purpose, bar charts of the type used in the Denver Developmental Screening Test would be useful (Frankenberg and Dodds, 1967). However, even the most comprehensive developmental schedule must be used with discretion and it is essential that personnel responsible for developmental assessments should be adequately trained and participate in regular refresher courses.

THE CHILD AS A PART OF THE COMMUNITY

At the community level, studies of the factors influencing the development of normal children may indicate actions which can be taken to reduce the incidence of developmental defects. In this study of normal Glasgow children, scores were calculated for the different aspects of development which were examined at intervals during the first year of life. These scores were not regarded as providing developmental quotients but were used as a research tool. They enabled comparisons to be made between the performance levels of groups of children in the same skill at the same age level. It was observed that, at each age level for which these scores were calculated, the Sit Walk, Table Top and Social scores were distributed around the mean value in a reasonably normal manner but with a slight skew to the left. The Hand Eye scores at 4 weeks and the Physical scores at 4, 16 and 28 weeks were also distributed in this way. By the 16 week age level, many of the children had achieved a high level of performance in the skills measured by the Hand Eye score and by 28 weeks, most children had achieved almost all of the items included in this score; the Physical scores showed a similar picture by 40 and 52 weeks (diagrams 13-28). Thus at these age levels the Hand Eye and Physical scores were not distributed normally but were clustered at the top end of the range with a "tail", composed of the few children with abnormally low scores.

Children with known abnormalities and those of a birth weight of 4½ pounds or less or born after a gestation period of less than 36 weeks, were excluded from the population from which the main sample was drawn. Despite this exclusion of those children most likely to be retarded in their early development (Davie et al., 1972; Drillien, 1964), almost all the developmental scores calculated showed some negative skewness. This finding is common to most physiological variables and indicates that some children were outside the range of scores which would have been obtained if the variations in the levels of score obtained had been the result of normal variation alone. The scores were used to assess the influence of various social and obstetric factors on the early development of the children studied.

In the studies summarized in Tables I - IV, the only obstetric factors which were found consistently to affect early developmental progress were low birth weight, 4½ pounds or less, and a gestation period of 36 weeks or less. The full effects of obstetric hazards may not be detectable until the child is of an age at which defects of an emotional nature can be observed. A few of the workers who studied the development of children at one year of age or younger, did consider that obstetric hazards had a deleterious effect on early developmental progress (Drage et al., 1966; Honzik et al., 1965; Stechler, 1964; Zachau-Christiansen, 1967). The factors most frequently implicated were toxaemia of pregnancy, bleeding in pregnancy and neonatal asphyxia or apnoea. Roberts (1970 and 1971) found an association between low developmental scores around one year and toxaemia and ante-partum haemorrhage; he noted that, in his study, these conditions were associated frequently with gestational immaturity and suggested that, in themselves, they might not be connected causally with neurological and developmental defect.

Other workers have been unable to find any association between early developmental scores and neonatal asphyxia or low Apgar scores

(Graham et al., 1957; Richards et al., 1968; Ucko, 1965) or dysfunctional or prolonged labour (Friedman et al., 1969; Keith et al., 1950). From these studies and the others reviewed here and by Nelson (1968), there is some evidence to support the view that, when a child survives these obstetric hazards and does not sustain neurological damage, manifest in the neonatal period, such hazards have no detectable effect on the child's subsequent developmental progress.

Even in this study, where children of very low birth weight and short gestation had been excluded, it was found that both birth weight and gestation period could be demonstrated to be associated adversely with early development. The children of a birth weight between 4lb 8oz and 6lb 9oz had significantly lower mean Hand Eye and Physical scores than the rest of the sample at the 4 and 16 week examinations; those children who were born after a gestation period of 36 to 38 weeks had a significantly lower mean Hand Eye score at the 4 week age level. Apart from these findings, none of the obstetric factors examined were associated in a consistent or significant way with reduced levels of any score at any age level studied.

The findings of this study may show only that the developmental tests used were not sufficiently sensitive to detect any ill-effects of these obstetric hazards on development during the first year of life. However, some of the hazards studied appeared to be associated with an enhanced performance level in the tests used; this was particularly so when the performance levels of children born after several hazards of labour and delivery or after a toxaemic pregnancy, were considered. When the group of children who had no young siblings (aged less than

5 years) were considered separately, a consistent relationship between high developmental scores and obstetric hazards was not apparent.

In this study, the complications of labour and delivery and the individual obstetric hazards were found to be related,to a statistically significant degree, to social class and family size. Such complications were, in general, more likely to arise in connection with the first pregnancy of a woman from the upper social class groups. The relationship described between high developmental scores and obstetric hazards is a spurious one and reflects the relationship between the developmental scores and social class and family size.

A social class gradient was found in the developmental scores; the children whose fathers had professional, managerial and clerical posts, social classes I, II and IIIa tended to obtain higher scores than the rest of the sample. This was the case for the Hand Eye, Table Top and Social scores at all age levels. The Physical and Sit Walk scores obtained by these children were also likely to be higher at the 4, 16 and 28 week age levels; at 40 and 52 weeks, the social class gradient had been replaced by an inverted U-shaped distribution with the children from social class IV having the highest mean values for both Physical and Sit Walk scores.

Gradients were also found in the distribution of scores by the social class of the mothers before marriage. For the Hand Eye, Table Top and Social scores, the mean value of the scores at each age level decreased as the social class scale was descended. For the Physical and Sit Walk scores, the gradient was in the opposite direction with the children whose mothers had been in social class IV and V before their marriage having the highest scores.

In these samples, social class was related to family size, with an excess of large families at the lower end of the social scale. In each area of development, at each age level studied, the developmental scores decreased as family size and the number of young children in the family increased. It could be suggested that the effect of family size on the Hand Eye, Table Top and Social scores might be a reflection of the relationship between social class and developmental scores. But it would seem that, for the Physical and Sit Walk scores at least, the effect of family size is independent of that of social class. At each age leve, first born children had the highest mean Physical and Sit Walk scores and third and subsequent children the lowest. Thus despite the relationship between social class and family size, the trend for the children from the lower social class groups to obtain higher Physical and Sit Walk scores at 40 and 52 weeks is not sufficiently strong to overcome the relationship described above between family size and physical development.

From the results of this study, it would appear that an improvement in the level of obstetric care would only affect the developmental progress of young children if it were to reduce the incidence of gestational immaturity and ensure that each child reaches his optimum weight before birth. Any incidental effect on the occurrence of other obstetric hazards would be unlikely to affect the early developmental progress of young children measured by developmental assessment during the first year of life. The relationship between family size and social class and developmental progress found in this study was so marked that it caused spurious and unlikely relationships to be detected between the obstetric hazards and the developmental scores.

The findings here are similar to those of Klackenberg-Larsson and Stensson (1968) who considered that the most important influence on a child's developmental progress was his mother's educational level. The effect of family size on early development was noted by Hindley (1961) and Pasamanick (1946); both these workers observed that children with siblings aged 5 years or less obtained lower developmental scores than only children or children whose siblings were all above 5 years of age.

It is difficult to study the effects of any single obstetric or social factor: obstetric hazards frequently occur together (Table XXI; Baird, 1970; Roberts, 1969) and these hazards are not distributed evenly by social class (Table XXII; Butler and Alberman, 1969). Social class is a method of classification which can obscure considerable differences, both social and financial. The effect of family size on the family income and outlook is likely to differ in these different social class groups; where money is adequate, feeding and caring for a large family may present no problems but, in a poor family, the birth of a second child can precipitate financial crisis. Yudkin has said that "Mismanagement is no prerogative of the poor. The difference is that the poor cannot afford to mismanage" (Yudkin and Yudkin, 1968). Sufficient money going into a home does not necessarily make that household a good environment for a child. However, there is a relationship between intelligence and social class, and unfortunately, it is frequently those who are in most need of skill in budgeting and household management who are least equipped with the ability to acquire these skills.

It has been suggested that social class alone has little effect on developmental progress but that the poor nutritional status of children from lower social class homes may be the factor responsible for their slow developmental progress (Pasamanick et al., 1956). The evidence available from animal studies does suggest that malnutrition affects the developing brain (Winick, 1971). The studies on human infants are, of necessity, without proper controls but they do indicate that malnutrition in early infancy may be responsible for a reduction of the developmental potential. (Brown and Mathery, 1971; Chase and Morton, 1970; Cravioto et al., 1966; Frisch, 1970).

The interrelationship between social class, intelligence and nutritional status is complicated. Douglas (1969) found a relationship between intelligence quotients and height in 15 year old children who had been "light for dates" at birth, with the exception of the small group of "two generation" middle class children; this group was also the only one in which height did not decrease as birth rank increased. It is probable that one must consider not only the social class and the nutritional status of the children being observed and of their parents, but that of their grandparents and possibly of their great grandparents too.

It would appear that there are no relatively simple medical measures which can be taken to ensure that each child reaches his maximum potential of intelligence or ability. Improved environmental conditions and educational opportunities would seem to be the only means of achieving this aim. Unfortunately, such vague ideals are less likely to be attained than one definite change in medical practice, however difficult or expensive this might be.

Social conditions have improved greatly during the twentieth century; social security payments are available for various needy categories and attempts are being made to provide better housing. The school leaving age has been increased to a minimum of 16 years recently. Many people consider this unwise as schools are overcrowded and understaffed and the 15 year old children are not interested in "school learning". Some schools are already using this extra year to teach the children, or better to encourage the children to learn, about life as adults and their responsibilities to themselves, their families and the community. If all children could be enabled to learn more about how to manage their lives successfully, by learning about nutrition and food, budgeting, home management and the care of the family, the environmental conditions in which they will bring up their own families might be improved.

Adult education is needed too, both today and in the future. Conventional health education is of little value for this purpose; it rarely reaches those most in need of it. Radio and television can help here; "The Archers" began as a medium through which education could be provided for farmers and has continued as a popular radio serial. Individual help for parents is frequently needed; some of this is already provided by health visitors. Health visitors frequently find that they have to provide information on many aspects of family life, budgeting, cooking, the completion of the various forms by which allowances are applied for etc.. It may be that a special service is required to fill this necessary role. And despite all educational efforts, it is likely that there will remain a group of people, who, for the sake of their children, will need continued help and support.

APPENDIX 1

FORMS USED IN THE STUDY

FORM 1.

SOCIAL PAEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT

Date	Record number	/_/_/_/	1-3
	Examination	/_/_/	4-5
	Actual age (weeks)	/_/_/	6-7
Identification	Index number	/_/_/_/_/_/	8-12

Child s name: Surname   Date of birth.

Christian name

Address:

Legitimacy	0 Legitimate	1 Illegitimate	/_/	13
Sex	0 Male	1 Female	/_/	14

Pregnancy and delivery

Duration of pregnancy (weeks)		/_/_/	15-16
Complications of pregnancy	0 None 1 Threatened abortion 2 A.P.H. 4 Toxaemia 8 Anaemia 16 Other	/_/_/	17-18
Place of delivery (specify)	0 Home 1 Hospital 2 Nursing Home 3 Other	/_/	19
Onset of labour	0 Spontaneous 1 Oxytocic 2 Surgical	/_/	20
Type of delivery	0 Normal 1 C.S. 2 Forceps or ventouse 4 Other	/_/	21
Labour	0 Normal 1 Abnormal (specify)	/_/	22

Infant

Birth weight (lbs. ozs.)		/_/_/ /_/_/	23-26
Neonatal complications	0 None 1 Incubator or oxygen therapy 2 Exchange transfusion 4 Other (specify)	/_/	27

Illnesses

Illnesses	0 None 1 Convulsions 2 Other significant illnesses (specify)	▱	28
Hospital admissions	0 No 1 Yes (specify hospital, reason and dates)	▱	29
Feeding	0 Not breast fed or for less than 2 weeks 1 Breast fed (state duration)	▱	30
Feeding difficulty	0 None 1 Moderate 2 Severe	▱	31
Immunizations	0 All relevant ones 1 Some 2 None	▱	32

<u>Family History</u>

No. of living sibs (specify age and sex)		▱	33
Sibs not yet at school (number)		▱	34
Health of sibs	0 Normal or not applicable 1 Congenital defect (specify) 2 Special schooling 4 Other	▱	35
Previous abortions		▱	36
livebirths		▱	37
Stillbirths (specify cause)		▱	38
neonatal deaths (specify cause)		▱	39
Parents' health	0 Normal 1 Significant illness (specify)		
	Father	▱	40
	Mother	▱	41

<u>Parents' Education and Employment</u>

Father's occupation :	Social class	▱	42
Mother's employment : before marriage	Social class	▱	43

Parents' education /

Parents' education.

Age at leaving school	0 <15			
	1 15			
	2 16			
	3 17+	Father		44
	4 Not known	Mother		45
Further education or training	0 None			
	1 University			
	2 Training or technical college			
	3 Secretarial			
	4 Apprenticeship			
	5 Other (specify)			
	6 Not known	Father		46
		Mother		47

Mother's employment at present (specify)

0 None
1 Morning
2 Afternoon
4 Evening
8 Night — 48-49
Days per week — 50

Baby minding

0 Mother
1 Relatives or friends
2 Paid baby-minder
3 Nursery or creche
4 Other arrangement (specify) — 51

Social Circumstances.

Occupants of house
0 Family (parents and children) only
1 Others (code number) — 52

Total number of rooms — 53

Facilities. Running hot water 0 No 1 Yes — 54

Own cooking facilities 0 No 1 Yes — 55

Toilet
0 Own inside
1 Own outside
2 Outside shared (state no. families) — 56

Type of property
0 Detached, semi-detached or terraced house
1 Tenement flat
2 Multistorey flat
3 Other flat
4 Rooms let in lodgings
5 Other — 57

Condition of property 0 Very good, 1 Good, 2 Fair, 3 Poor — 58

Behaviour and Development /

Behaviour and Development

Landmarks (weeks)	Smiling	/_/_/	59-60
	Sitting unsupported	/_/_/	61-62
Sleep (hours)	0 <12 1 12- 2 18+	/_/	63
Activity	0 Normal 1 Underactive, placid 2 Overactive	/_/	64
Interest in surroundings	0 Average 1 Uninterested 2 Very curious	/_/	65
Personality	0 Average 1 "Grizzly", miserable 2 Very happy and contented	/_/	66
Appetite	0 Average 1 Poor 2 Good	/_/	67
Cuddling	0 Won't have it 1 Enjoys it 2 Demands it	/_/	68

Assessment

History	0 Unsatisfactory 1 Satisfactory 2 Uncertain	/_/	69
	0 Uncooperative 1 Cooperative	/_/	70
Person interviewed	0 Mother 1 Other (specify)	/_/	71
	0 Relaxed 1 Average 2 Tense	/_/	72
	0 Normally interested 1 Overconcerned 2 Unperceptive 4 Disinterested	/_/	73
Child	0 Eager and cooperative 1 Cooperative 2 Shy and uncooperative 3 Aggressive and uncooperative	/_/	74
Restriction of child	0 Moderate 1 Minimal 2 Severe (specify)	/_/	75
Toys, books, etc.	0 Adequate 1 Doubtful 2 Inadequate	/_/	76
Cleanliness of home	0 Very good 1 Good 2 Fair 3 Poor	/_/	77
Cleanliness of child	0 Very good 1 Good 2 Fair 3 Poor	/_/	78
	Card code	/5/6/	79-80

FORM 2.

SOCIAL PAEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT

GENERAL EXAMINATION

Record no. /__/__/__/ 1-3

D.O.B. ____________ Examination /__/__/ 4-5

Actual age (weeks) /__/__/ 6-7

Posture (head centred in mid-line)

Upper limbs	0 Semiflexed	1 Flexed	2 Extended	/__/	8
Lower limbs	0 Semiflexed	1 Flexed	2 Extended	/__/	9
Approximately symmetrical		0 Yes	1 No	/__/	10
Opisthotonus present		0 No	1 Yes	/__/	11
Frog posture present		0 No	1 Yes	/__/	12
Constant head turning to one side		0 No	1 Yes	/__/	13

Eyes

Palpebral fissures		0 Equal	1 Unequal	/__/	14
Ptosis	0 Absent 1 Present right 2 Present left 3 Present bilaterally			/__/	15
Expression	0 Alert	1 Impassive		/__/	16
Eyes	0 Centred 1 Constant deviation 2 Constant strabismus bilaterally 3 Constant strabismus right 4 Constant strabismus left 5 Nystagmus			/__/	17

Mouth

Tongue	0 Not protruded constantly 1 Protruded constantly			/__/	18
Retrusion reflex	0 Absent	1 Present		/__/	19
Sucking reflex	0 Present	1 Absent		/__/	20
Rooting reflex	0 Present	1 Absent		/__/	21

Spontaneous Motor Activity (head centred in mid-line)

Alternating movements in arms and legs	0 Yes	1 No	/__/	22
Symmetrical, both upper and lower limbs	0 Yes	1 No	/__/	23
Movements show normal intensity and speed	0 Yes	1 No	/__/	24
Tremor present	0 No	1 Yes	/__/	25
Overshooting, rapid movements	0 No	1 Yes	/__/	26

Rhythmical /

Rhythmical jerks	0 No	1 Yes		▱ 27
Convulsions	0 No	1 Yes		▱ 28

Hands

Held
0 Clenched, thumb in
1 Clenched, thumb out
2 Mostly open ▱ 29

To mouth	0 No	1 Yes (O)	2 Yes (H)	▱ 30
Hand regard	0 No	1 Yes (O)	2 Yes (H)	▱ 31
Together in midline in play	0 No	1 Yes (O)	2 Yes (H)	▱ 32
Pulls dress over face	0 No	1 Yes (O)	2 Yes (H)	▱ 33
Grasps toes in supine	0 No	1 Yes (O)	2 Yes (H)	▱ 34
Pulls feet to mouth	0 No	1 Yes (O)	2 Yes (H)	▱ 35

Palmar grasp
0 Present symmetric
1 Present asymmetric
2 Present weak
3 Absent
- n.a. ▱ 36

Voluntary grasp
0 Drop toy put in hand at once
1 Retain briefly toy put in hand
2 Retain toy long enough to glance at it
3 Retain toy long enough to regard it
4 Takes toy to mouth
- Higher level of development ▱ 37

Vision

Pupils 0 Equal 1 Unequal ▱ 38

Pupillary reaction
0 Present, equal
1 Present right, absent left
2 Present left, absent right
3 Absent both ▱ 39

Blink response 0 Present 1 Absent - n.a. ▱ 40

Follows pencil torch at 1 foot 0 Yes 1 No - n.a. ▱ 41

Dangled toy
0 No reaction
1 Regards it only when brought in front of eyes
2 Delayed regard at 4-6"
3 Prompt regard at 4-6"
4 Excited, waving etc. at toy
5 Brings both hands up to toy
- Higher level of development ▱ 42

Moving toy /

Moving toy

0 No reaction
1 Regards briefly, does not follow.
2 Follows to midline (90°)
3 Follows past midline
4 Follows side-to-side (180°)
5 Follows vertically
6 Follows in a circle
- Higher level of development — 43

Hearing

Startle response — 0 Absent — 1 Present — 44

0 No reaction
1 "Freezes"
2 "Puzzled" search for sound
3 Immediate localisation both ears
4 Delayed localisation both ears
5 Immediate localisation right ear only (delayed or absent on left)
6 Immediate localisation left ear only (delayed or absent on right)

Bell	45
Cup and spoon	46
Tissue paper	47
High tone rattle	48
Sibilants	49
Voice	50

Tendon Jerks

0 Present symmetric
1 Asymmetric R > L
2 Asymmetric L > R
3 Absent

Biceps	51
Triceps	52
Supinator	53
Knee	54
Adductor spread with knee jerk	55
Ankle	56
Plantar	57
Clonus	58

Pressure on Foot

"Allongement Croisee" response — 0 Present — 1 Absent — n.a. — 59

Magnet response — 0 Present — 1 Absent — n.a. — 60

Resistance to Passive Movements (head centred midline)

0 Normal symmetrical
1 Low symmetrical
2 High symmetrical
3 Right > left
4 Left > right

Neck	61
Trunk	62
Arms	63
Legs	64

Traction Response /

Traction Response

Resistance in arms   0 Normal   1 Low   2 High   ☐ 65

Head lag
0 Complete
1 Incomplete
2 No head lag
3 Lifts head spontaneously when being pulled up
4 Lifts head spontaneously when about to be pulled up
5 Lifts head spontaneously from supine
- Higher level of development   ☐ 66

Sitting

Held in sitting
0 No head control; back curved
1 Head erect momentarily
2 Head held steady, set forward; head wobble when swayed.
3 Head held steady, erect, thoracic spine straight.
4 Back straight, no head wobble when swayed   ☐ 67

Prone

Position of head
0 To one side
1 Head midline, slightly up
2 Face at 45^{0} to couch momentarily
3 Face maintained at 45^{0} to couch
4 Face at 90^{0} to couch momentarily
5 Face maintained at 90^{0} to couch
6 Head and chest up, supported on forearms
7 Head and chest up, supported on one forearm and one extended arm
8 Head and chest well up, supported on extended arms
9 Head and chest well up, supported on one arm
- Higher level of development   ☐ 68

Arms
0 Under chest
1 Out, stationary on table, hands clenched
2 Out, stationary on table, hands open
3 Out, hands scratching at table surface
- Higher level of development   ☐ 69

Pelvis
0 High
1 Intermediate
2 Flat
- Higher level of development   ☐ 70

Legs
0 Knees drawn up under abdomen
1 Intermittently kicks out
2 Legs held extended
- Higher level of development   ☐ 71

Can /

Can roll from supine to prone 0 No; 1 Yes(O); 2 Yes(H) /_/ 72

Can roll from prone to supine 0 No; 1 Yes(O); 2 Yes(H) /_/ 73

Mobility
0 No apparent attempt to travel
1 Vigorous swimming movements
2 Pivots in a circle using arms
3 Progresses by rolling
4 Progresses by squirming backwards
5 Progresses by squirming forwards
6 Single "hitch"
7 Double "hitch"
8 Creeps on hands and knees
9 Creeps sole of foot intermittently on couch
- Higher level of development /_/ 74

Plantar grasp
0 Present symmetric
1 Present asymmetric
2 Present weak
3 Absent /_/ 75

Card code /1/5/7/ 78-80

Record No. /_/_/_/ 1-3

Examination /_/_/ 4-5

Ventral Suspension

Head
0 Droops
1 In plane of body momentarily
2 Maintained in plane of body
3 Above plane of body
4 Maintained well above plane of body /_/ 6

Arms
0 Flexed
1 Partly extended
2 Extended
3 Moving
4 Hanging limply /_/ 7

Legs
0 Flexed
1 Partly extended
2 Extended
3 Moving
4 Hanging limply /_/ 8

Landau response 0 Present 1 Absent /_/ 9

Trunk elevating response 0 Present 1 Absent /_/ 10

Parachute response 0 Present 1 Absent /_/ 11

Vertical Suspension

Head
0 Flops
1 Held erect intermittently
2 Held erect /_/ 12

Legs /

Vertical Suspension (Cont'd)

Legs
~~0 Semi-flexed~~
1 Extended
2 Moving
3 Held at right angles to body
4 Fixed extension with adduction or scissoring ▱ 13

Positive Supporting

0 Involuntary weight bearing (knees flexed)
1 Bears no weight, knees sag
2 Bears some weight (knees extended voluntary) on toes
3 Bears some weight (knees extended voluntary) on flat of foot
4 Bears almost all weight
5 Bounces with delight
- Higher level of development ▱ 14

Placing response 0 Present 1 Absent ▱ 15

Stepping reaction 0 Present 1 Absent ▱ 16

Tonic Neck Reflex
0 Adopted spontaneously
1 Imposable
2 Imposable and obligate
3 Not imposable ▱ 17

Neck Righting Reflex
0 Imposable
1 Imposable and obligate
2 Not imposable ▱ 18

Moro Response
0 Complete, with abduction and extension
1 Complete, but very easily elicited
2 Incomplete, flexion with adduction only
3 Absent ▱ 19

Response symmetrical 0 Yes 1 No - n.a. ▱ 20

Tremor 0 Absent 1 Slight 2 Marked - n.a. ▱ 21

Withdrawal Reflex 0 Present 1 Absent ▱ 22

Physical Examination

Crying 0 Normal 1 Excessive(normal) 2 Abnormal ▱ 23

Nutritional state 0 Good 1 Fair 2 Poor ▱ 24

Skin elasticity 0 Good 1 Fair 2 Poor ▱ 25

Mucous membranes 0 Normal 1 Pale 2 V.pale ▱ 26

Cyanosis Peripheral 0 Absent 1 Present(0) 2 Present(H) ▱ 27

Central 0 Absent 1 Present(0) 2 Present(H) ▱ 28

Breathing Rate 0 Normal 1 Slow 2 Fast ▱ 29

Regularity 0 Regular 1 Irregular ▱ 30

Accessory muscle activity 0 Absent 1 Present ▱ 31

C.V.S/

C.V.S.	0 Normal	1 Abnormal (specify)	/_/	32
R.S.	0 Normal	1 Abnormal(specify)	/_/	33
A.S.	0 Normal	1 Abnormal(specify)	/_/	34

Length (ins.) /_/_/ /_/_/ 35-38

Head circumference (ins.) /_/_/ /_/_/ 39-42

Card code /2/5/7/ 78-80

Comment.

FORM 3.

SOCIAL PAEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT

Record no. /__/__/__/ 1-3

Examination /__/__/ 4-5

Actual age (weeks) /__/__/ 6-7

Each item coded as 0 - No
1 - Yes (O)
2 - Yes (H)
3 - Has occurred since last examination, no longer present (H)
\- Higher level of development

General understanding and social behaviour

Smiles when spoken to	/__/	8
Smiles spontaneously at adults or children	/__/	9
Smiles and vocalizes when spoken to or pleased	/__/	10
Initiates 'conversation' with toys or people	/__/	11
Shouts to attract attention	/__/	12
Pulls adult's clothes to attract attention	/__/	13
Makes wishes and needs known by grunts, gestures, etc.	/__/	14
'Appreciates' nursery games	/__/	15
Plays nursery games after demonstration	/__/	16
Plays nursery games if asked	/__/	17
Repeats performance laughed at	/__/	18
Knows and turns to own name	/__/	19
Understands 'no'	/__/	20
Understands 'bye-bye' or 'ta-ta'	/__/	21
Understands and obeys simple commands	/__/	22
Points to familiar persons, etc. if asked	/__/	23
Understands several words in usual context	/__/	24
Friendly to strangers	/__/	25
Some shyness with strangers	/__/	26
Helps with dressing by holding out arms for sleeves	/__/	27
Helps with dressing by holding out feet for shoes	/__/	28
Helps more constructively with dressing	/__/	29

Visual interest /

Visual interest

Indefinite stare at window or blank wall 30
Interest in surroundings 31
Glances one object to another 32

Eyes follow moving person 33
Watches activities of people at 10-12' with interest 34
Watches events in street intently 35

Watches adult's face intently 36
Visually recognizes mother 37
Recognizes family and friends 38

Auditory awareness

Stops whimpering when spoken to 39
Quietens at sounds of mother's approach, before she can be seen 40
Appropriate response (or excitement) to household noises 41
Selectively recognizes mother's voice 42
Shakes rattle deliberately to make it sound, may look at it earnestly while doing so 43

Vocalization

Gutteral noises, other than crying 44
Single vowels (ah, eh, uh) 45
'Mum-mum-mum' especially when crying 46
Some vowel sounds in series (ahah-ah, eh-eh-eh) 47
Vocalizes tunefully, using single syllable with consonant (da, ba, goo) 48
Babbles tunefully repeating syllables in strings (mama, baba, - meaningless) 49
Jabbers freely, using a wide range of inflections and phonetic units (jargon) 50

Says 'dada' or 'mama' with meaning 51
Says 'dada' or 'mama'and one or two other words 52
Says 'dada' or 'mama'and > two other words 53

Tries to imitate adults' playful sounds 54
Imitates adults' playful sounds with abvious delight 55

Chuckles 56
Laughs out loud 57
Squeals with pleasure 58
Screams with annoyance 59
Grunts and growls with effort 60

Feeding behaviour /

Feeding behaviour

Quietens at sight of bottle /_/ 61
Obvious excitement at sight of bottle /_/ 62
Reaches out to proffered bottle /_/ 63

Pats bottle when feeding /_/ 64
Puts hands round bottle when feeding /_/ 65
Drinks from cup with assistance /_/ 66
Holds cup to drink, if adult gives cup and takes it away /_/ 67
Will drink from cup and threw it away when satisfied /_/ 68
Will drink from cup and put it down when satisfied /_/ 69

Tries to grasp spoon when being fed /_/ 70
Holds spoon, but cannot use it alone /_/ 71
Attempts to use spoon, licks it but turns it over /_/ 72
Feeds himself with spoon /_/ 73

Takes everything to mouth /_/ 74
Bites and chews on biscuit or rusk /_/ 75
Chews solids well /_/ 76
Shows obvious likes and dislikes of food /_/ 77

Card code /1/5/8/ 78-80
Record no. /_/_/_/ 1-3
Examination /_/_/ 4-5

Sitting

Sits with support on settee, etc. /_/ 6
Sits with support on settee and can turn head side to side /_/ 7
Sits forward in pram with reins /_/ 8
Sits on floor with hands forward for support /_/ 9
Sits seconds on floor without support /_/ 10
Sits 10 minutes on floor without support /_/ 11
Sits well and for indefinite time /_/ 12

Can lean forward and recover balance /_/ 13
Can lean to side and recover balance /_/ 14

Can go into prone from sitting /_/ 15
Can get to sitting from prone /_/ 16
Can pull himself to sit /_/ 17
Can sit up unaided /_/ 18

Standing and Walking

Stands when hands held at shoulder-height /_/ 19
When held standing steps on alternate feet /_/ 20
Walks if hands held at shoulder height /_/ 21
Walks if one hand held /_/ 22

Stands /

Stands holding onto furniture /_/ 23
Stands at furniture, lifts feet up and down /_/ 24
Sidesteps around furniture /_/ 25
Walks holding onto furniture with one hand only /_/ 26

Can stand alone momentarily /_/ 27
If standing, takes few steps and falls /_/ 28
Walks alone unsteadily, arms high /_/ 29
Walks well /_/ 30

Pulls self to standing /_/ 31
Can get to feet alone /_/ 32

Lets himself down from standing with a bump /_/ 33
Lets himself down from standing gently, with support /_/ 34
Lets himself down from standing gently /_/ 35

Can climb on ledge or step /_/ 36
Crawls upstairs /_/ 37
Walks upstairs, hand held /_/ 38
Walks upstairs holding onto wall /_/ 39
Gets downstairs (by any method) /_/ 40

Can kneel with support on floor /_/ 41
Can kneel without support on floor /_/ 42

Card code /2/5/8/ 78-80

FORM 4.

SOCIAL PAEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT

TABLE TOP SITUATIONS

Record no.	/__/__/__/	1-3
Examination	/__/__/	4-5
Actual age (weeks)	/__/__/	6-7

EACH ITEM CODED AS 0 NO ; 1 YES(O) ; 2 YES(H) ; - N.A.

Cubes

Grasps cube only if given to him	/__/	8
Reaches and picks up cube with both hands	/__/	9
Reaches and picks up cube with one hand only	/__/	10
Holds cube in centre of palm with all fingers	/__/	11
Holds cube to radial side of palm	/__/	12
Picks up and holds cube with ends of fingers	/__/	13
Puts cube in mouth	/__/	14
Holds one cube and looks at second one offered	/__/	15
Drops one cube when offered another	/__/	16
Holds first cube when given another	/__/	17
Holds two cubes and looks at third one offered	/__/	18
Drops one of two cubes held to take third one	/__/	19
Bangs cube up and down when sitting	/__/	20
Transfers cube easily hand to hand	/__/	21
Hits cube in hand at cube on table	/__/	22
Picks up one cube and then another	/__/	23
Holds two cubes prolongedly	/__/	24
"Compares" two cubes	/__/	25
Some constructive play with massed cubes	/__/	26
Reach for cube dropped within reach	/__/	27
Persists in reaching for cubes out of reach	/__/	28
Looks after falling cubes	/__/	29
Searches in correct place for dropped cube	/__/	30

Drops /

Drops cubes deliberately and watches them fall ☐ 31
Throwing toys on floor, for them to be picked up ☐ 32

Will 'give' cube to adult but not release it ☐ 33
Can release cube against table but not <u>put</u> it down ☐ 34
Can put cube down, lift hands off ☐ 35

Tries unsuccessfully to build 'tower of two' if shown ☐ 36
Can build 'tower of two' if shown ☐ 37

Can pick up two small objects in one hand in play ☐ 38

<u>Cup</u>

Pushes at it ☐ 39
'Examines' it ☐ 40
Demonstrates that he knows its use ☐ 41

<u>Cup and cubes</u>

Hits, pushes cup with cubes ☐ 42
Pokes at cube in cup, plays with it but doesn't remove it ☐ 43
Will remove cube from cup ☐ 44
Tips cubes out of cup ☐ 45
Will put cube into cup if shown but not release it ☐ 46
Will put cube into cup and release, if shown ☐ 47
Spontaneously puts cubes into cup ☐ 48
Plays constructively with cubes in and out of cup ☐ 49

<u>Pellet</u>

Looks at pellet with interest, does not touch it ☐ 50
Knocks pellet off table with sweeping movements ☐ 51
Scooping two-handed approach to pellet ☐ 52
Raking one-handed approach to pellet ☐ 53
Secures pellet any method ☐ 54
Pokes at pellet with index finger ☐ 55
Grasps pellet between finger and thumb, forearm supported on table ☐ 56
Precise pincer grasp ☐ 57

<u>Pellet in bottle</u> /

Pellet in bottle

Looks at pellet ~~only if it drops out of bottle~~	/_/	58
Points at pellet through glass	/_/	59
Shakes pellet out of bottle	/_/	60

Pellet and bottle

Approaches bottle first	/_/	61
Approaches pellet first	/_/	62
Grasps pellet only	/_/	63
If shown, tries to insert pellet in bottle, fails	/_/	64
If shown, can insert pellet in bottle	/_/	65
Inserts pellet in bottle, spontaneously	/_/	66

Bell

Two-handed approach, held anyhow	/_/	67
Handle grasped, low down, with one hand	/_/	68
Attempt to imitate ringing action	/_/	69
Grasps bell neatly by handle, pokes clapper	/_/	70
"Drinks" from cup of bell	/_/	71
Rings bell briskly in imitation	/_/	72

Ring and string

Reaches for ring repeatedly, doesn t try to secure it by string	/_/	73
Reaches for ring repeatedly then secure it by string	/_/	74
Secures ring by string immediately	/_/	75
Hold ring in one hand and play with string with other	/_/	76
Dangles ring by string immediately	/_/	77
Card code	/1/5/9/	78-80
Record no.	/_/_/_/	1-3
Examination	/_/_/	4-5

Mirror

No reaction to mirror image	/_/	6
Regards mirror image intently	/_/	7
Smiles at mirror image	/_/	8
Smiles and talks to self if close to mirror	/_/	9
Kisses image of self in mirror	/_/	10
Pats image of self in mirror	/_/	11
Reaches for image of toy in mirror	/_/	12
Offer toy to image of self	/_/	13

Drawing /

Drawing

Makes 'jabbing' marks on paper in imitation of scribble	/_/	14
Imitates scribble	/_/	15
Tries to imitate stroke	/_/	16

Picture book

Looks with interest at pictures in book	/_/	17
'Helps' turn pages of book	/_/	18
Looks with interest and pats at pictures in book	/_/	19

Formboard

Looks selectively at round hole	/_/	20
Attempts to insert round block, if shown	/_/	21
Succeeds in inserting round block, if shown	/_/	22
Inserts round block promptly without demonstration	/_/	23

Ball play

Looks at ball rolled towards him	/_/	24
Attempts to grasp ball rolled towards him	/_/	25
Succeeds in grasping ball rolled towards him	/_/	26
Using a 'casting motion' will attempt to throw ball to adult	/_/	27

Card code /2/5/9/ 78-80

FORM 5.

STUDY OF CHILD DEVELOPMENT

Child's name:	Record number	/__/__/__/	1-3
Date of birth:	Week No.		
Total no. of sibs		/__/	4
Total no. of sibs under 5 years		/__/	5
Total no. of sibs at Nursery	full/part-time	/__/	6
Total no. of sibs of schoolage	full/part-time	/__/	7
No. other adults in family		/__/	8
Sibs' attitude to child:	0 Over protective 1 Good 2 Average 3 Uninterested 4 Jealous - n.a.	/__/	9
Father/other adults attitude to child:	0 Over protective 1 Good 2 Average 3 Uninterested 4 Jealous - n.a.	/__/	10
Father's employment:		/__/	11
Mother's employment:		/__/	12
Family description:	0 Stimulating 1 Good 2 Fair 3 Poor	/__/	13
Cleanliness of home:	0 Very good 1 Good 2 Fair 3 Poor	/__/	14
Restriction of child:	0 Virtually none 1 Slight 2 Sensible and normal 3 Severe because of conditions 4 Severe	/__/	15
No. of living rooms		/__/	*

Mother's attitude to child:	0	Over protective		
	1	Good		
	2	Average		
	3	Uninterested		
	4	Jealous		
	-	n.a.	/__/	16
Mother's M.H. in last year:	0	N.A.D.		
	1	Specify	/__/	17
Mother's P.H. in last year:	0	N.A.D.		
	1	Specify	/__/	18
Pregnancy:	0	Before survey baby is 15 months		
	1	" " " 18 months		
	2	" " " 2 years		
	-	Not pregnant	/__/	19
Time mother spends with child on:				
Essential items	0	Average		
	1	Excess		
	2	Inadequate	/__/	20
Conscious "training"	0	Average		
	1	Excess		
	2	Inadequate	/__/	21
Social/play	0	Average		
	1	Good		
	2	Poor	/__/	22
Vocal contact	0	Average		
	1	Good		
	2	Poor	/__/	23
Child: General activity	0	Active		
	1	Medium		
	2	Passive	/__/	24
Approach to toys	0	Good concentration		
	1	Medium		
	2	Impatient	/__/	25
	0	Little toy exploitation		
	1	Medium		
	2	Inventive	/__/	26
General attitude:	0	Happy, not strange		
	1	Medium		
	2	Strange/scared	/__/	27
	0	Cheerfully co-operative		
	1	Co-operative		
	2	Shy & unco-operative		
	3	Aggressive & unco-operative	/__/	28

FORM 6.

SOCIAL PEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT.

Record number ☐☐☐ 1-3

Surname: Maiden Name:

Address: Mother's D.O.B.:

Place of Delivery

0 Home
1 Hospital
2 Nursing Home
3 Other
- Not known ☐ 4

Hospital

0 Belvidere
1 Calderbank House
2 Eastern District
3 Queen Mother's
4 Royal Maternity
5 Ross Hospital
6 Redlands
7 Stobhill
8 Robroyston
9 Southern General
- Other or not applicable ☐ 5

Child's Name:

D.O.B. Sex

E.D.D. Maturity (weeks) ☐☐ 6-7

Mother's Age at Delivery

0 <20 Yrs.
1 20-24 Yrs.
2 25-29 Yrs.
3 30 or >30 Yrs.
- Not known ☐ 8

Mother's Height

0 < 60"
1 60" - 61"
2 62" - 64"
3 65" or over 65"
- Not known ☐ 9

Antenatal Care

0 No Antenatal Care

Antenatal Care by

1 Hospital only
2 Hospital + L.H.A. clinic
3 Hospital + G.P.
4 L.H.A. clinic only
5 L.H.A. + G.P.
6 G.P. only
7 Hospital + L.H.A. + G.P.
8 Any other agency or combination
Specify:-
- Not known ☐ 10

Excess Weight Gain

(> 1½lb. (or 0.7 kg.) per week in any 4 week period after the 20th. week)

0 No excess gain
1 Excess gain
- Not known ☐ 11

Urinalysis/

Urinalysis

Glycosuria
0 Nil or trace once
1 + or more, only once
2 + or more, more than once with normal blood sugar
3 + or more, more than once with elevated blood sugar
4 Diabetes developing in pregnancy
5 Pre-existing diabetes
- Not known
☐ 12

Albuminuria
0 Nil
1 "Trace" appearing only after 20th week
2 Definite and persisting Albuminuria appearing after 20th week
3 Definite and persisting Albuminuria before 20th week
- Not known
☐ 13

Bacilluria
0 No Bacilluria
1 Bacilluria once only
2 Persistant Bacilluria
3 Urinary infection once only
4 Recurrent or persistant urinary infection
- Not known
☐ 14

Onset of Hypertension

0 Never or only once >140mm. Hg. systolic or 80mm. Hg. diastolic.

Twice over 140mm. or 80mm.
1 Reached before 20th week
2 Reached between 20th and 31st week
3 Reached between 32nd and 35th week
4 Reached at 36th week or later

1 Reading reaching 160mm. or 100mm.
5 Reached before 20th week
6 Reached between 20th and 31st week
7 Reached between 32nd and 35th week
8 Reached at 36th week or later
9 Readings of over 140mm. or 80mm. reached at 36th week or later but previous level unknown
- Not known
☐ 15

Toxaemia of Pregnancy

0 No toxaemia
1 Uncomplicated hypertension
2 Complicated hypertension
3 Late hypertension
4 Pre-eclamptic toxaemia (mild)
5 Pre-eclamptic toxaemia (Moderate)
6 Pre-eclamptic toxaemia (severe)
7 Eclampsia
8 Excess weight gain diagnosed as toxaemia
9 Chronic renal damage
- Insufficient data or not known
☐ 16

Anaemia

0 Hb. never < 10.4g. (70%) during ~~labour~~ pregancy
1 Hb.<10.4g. but corrected before labour
2 Hb.<10.4g. not corrected before labour
- Not known
☐ 17

Other Complications of Pregnancy/

Other Complications of Pregnancy

Hyperemesis	0 No	1 Yes	- Not known	☐ 18
Threatened Abortion	0 No	1 Yes (Code number)	- Not known	☐ 19

A.P.H.
0 No
1 Abruptio placentae
2 Placenta Praevia
3 Other - Specify:-
- Not known ☐ 20

Hydramnios
0 No 1 Yes ☐ 21

Unstable Lie
0 No 1 Yes ☐ 22

Version
0 Not attempted or not necessary
1 External version performed
2 External version attempted unsuccessfully
- Not known ☐ 23

Rh. Incompatability
0 Not present
1 Antibodies present
Specify treatment if any:-
- Not known ☐ 24

Membranes ruptured 48 hours or more before ONSET of labour
0 No 1 Yes ☐ 25

Other Complications 0 No 1 Yes ☐ 26
Specify

Special Procedure 0 No 1 Yes ☐ 27
Specify

Onset of Labour

0 Spontaneous - No induction
1 Spontaneous after failed induction
2 Successful induction
3 C.S. No induction
4 C.S. after failed induction
5 C.S. in labour after successful induction
6 C.S. in labour after spontaneous onset
- Not known ☐ 28

Induction

0 None or not applicable
1 Medical - oxytocin
2 Medical - no oxytocin
4 Surgical - membrane sweep
8 Surgical - A.R.M.
16 Other - Specify:-
- Not known ☐☐ 29-30

Apparent Reason for Premature Delivery/

Apparent Reason for Premature Delivery

0 No premature delivery
1 Hydramnios - no foetal abnormality
2 Foetal abnormality - with or without hydramnios
3 Multiple pregnancy
4 Uterine anomalies
5 Toxaemia - spontaneous onset, induction or C.S.
6 A.P.H.
7 C.S. or induction for reason not shown above
8 Spontaneous rupture of membranes
9 Recurrent premature labour without obvious cause
- Not known

▱ 31

Analgesia and Anaesthesia in Labour

0 None
1 Analgesic drugs
2 Inhalation anaesthesia
4 Pudendal block
8 Spinal anasthesia
16 General anaesthesia
- Not known

▱▱ 32-33

Duration of Labour

1st. stage
2nd. stage

0 No labour
1 0 - 1 hour
2 1 - 2 hours
3 2 + hours
- Not known

▱ 34

1st. and 2nd. stage

0 No labour
1 <12 hours
2 12 hours -
3 24 hours -
4 36 hours -
5 48 hours +
- Not known

▱ 35

Complications of Labour

Originating in Conceptus

0 None
1 Occiput posterior - (delivery as such or requiring rotation)
2 Deep transverse arrest
3 Face or brow - specify
4 Transverse lie
5 Breech
6 Cord prolapse
7 Foetal distress
8 Disproportion
9 Other - specify
- Not known

▱ 36

Originating in Mother or Placenta

0 None
1 Uterine dysfunction - hypotonic
2 Uterine dysfunction - hypertonic
3 Uterine dysfunction - contraction ring or tonic contraction
4 Placental abnormalities
9 Other - specify
- Not known

▱ 37

Delivery/

Delivery

0 Spontaneous delivery
1 Forceps - high or mid cavity
2 Forceps - low
3 Ventouse in 1st. stage or for delivery
4 Assisted breech delivery
5 Breech extraction
6 Bipolar or internal version
7 L.U.S.C.S.
8 Other or combination of above
Specify
- Not known

38

Placenta

0 Expelled spontaneously
1 P.P.H. with retained placenta
2 P.P.H. without retained placenta
3 Retained placenta without P.P.H.
- Not known

39

Placenta and Membranes

0 Complete and healthy
1 Infarcted - large areas
2 Infarcted - several small areas
4 Post placental clots
8 Anamalous structure
16 Other - Specify
- Not known

40-41

Card Code 0 6 0

FORM 6 - contd.

SOCIAL PEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT.

Record number ☐☐☐ 42-44

Child's Name:

Date of Birth: Sex:

Length. (C.H.)

0 Less than 20"
1 20"-21"
2 21"-22"
3 23"-24"
4 24" or more
- Not known ☐ 45

Head Circumference (O.F.C.)

0 Less than 12.0"
1 12.0" - 12.5"
2 12.5" - 13.0"
3 13.0" - 13.5"
4 13.5" - 14.0"
5 14.0" - 14.5"
6 14.5" - 15.0"
7 15.0" or more
- Not known ☐ 46

Birth Weight

lb. ozs.
(gm)

0 Under 2000gm. (4lb. 6ozs.)
1 2001 to 2500gm. (to 5lb. 8ozs)
2 2501 to 3000gm. (to 6lb. 9ozs)
3 3001 to 3500gm. (to 7lb. 11ozs)
4 3501 to 4000gm. (to 8lb. 13ozs)
5 4001 to 4500gm. (to 9lb. 14ozs)
6 Over 4500gm.
- Not known ☐ 47

Condition of Infant at Birth

Apgar Score(s)
0 - Apgar 10 Apgar score at 1 min. ☐ 48
1-9 Code score Apgar score at 2 min. ☐ 49
- Not known or not applicable Apgar score at 5 min. ☐ 50

Other scales/descriptions.
0 Active - cried at once
1 Limp and inactive
- Not known or not applicable ☐ 51

Resuscitation Required

0 Nil or mucus extraction only
1 Oxygen by face mask only
2 Endotracheal intubation with mucus extraction
4 Endotracheal intubation with oxygen by I.P.P.
8 Hyperbaric oxygen
16 Respiratory stimulants intramuscularly
32 Intravenous $NaHCO_3$
- Not known ☐☐ 52-53

Early Neonatal Care. (First 48 hours)

0 With mother
1 Cot nursed
2 Incubator
3 Other special care - Specify
- Not known ☐ 54

Neonatal Progress/

Neonatal Progress.

Birth Injury
0 None
1 Intra-cranial heamorrhage
2 Other birth injury
Specify
- Not known
▱ 55

Respiratory Distress.

0 None
1 Respiratory distress
2 Pneumonia
- Not known
▱ 56

Treatment Given
0 None
1 Oxygen only (by face mask)
2 Incubator
4 Endotracheal intubation
8 Hyperbaric oxygen
16 Intravenous $NaHCO_3$
32 Antibiotics
- Not known
▱▱ 57-58

Blood Dyscrasias

0 None
1 Physiological jaundice
2 Haemolytic disease - no treatment required
3 Haemolytic disease - transfusion
4 Haemolytic disease - exchange transfusion
5 Haemorrhagic disease of new born
- Not known
▱ 59

Biochemical Disorders

0 None
1 Hypoglycaemia
2 Neonatal tetany
3 Other - Specify
- Not known
▱ 60

Congenital Malformation

0 None
1 Major - Specify
2 Minor - Specify
- Not known
▱ 61

Other Neonatal Illnesses

0 None
1 Superficial infection
2 Vomiting/feeding difficulty
4 Other - Specify
- Not known
▱ 62

Other Infant Treatment

0 None
1 Antibiotics topical only
2 Antibiotics systemic
4 Blood transfusion
8 Other intravenous treatment
16 Surgery
32 Other medical - specify
- Not known
▱▱ 63-64

Birth Order in Multiple Pregnancy

0 Single birth
1 First of uniovular twins
2 Second of uniovular twins
3 First of binovular twins
4 Second of binovular twins
5 First of triplets or quads
6 Second of triplets or quads
7 Third of triplets or quads
8 Fourth of quads
- Not known
▱ 65

Card Code 0/6/0 78-80

APPENDIX 2

LETTERS USED IN THE STUDY

LETTER a.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH AND WELFARE DEPARTMENT

23 MONTROSE STREET,
GLASGOW, C.1
Tel: CEN. 9600
Extn. 2315
" 2418

5th. June, 1969.

Dear Sister,

Studies in Child Development.

Dr. Elizabeth White has now completed the first part of the investigation, having examined almost a hundred children in their homes at 40 weeks and again at 52 weeks. The second part of the study will involve examining a larger number (about 200) at 12 weekly intervals from 4 weeks to 52 weeks. The names will be selected randomly from Miss Campbell's list of births but, as we want to exclude certain categories (e.g. premature, congenitally malformed, and illegitimate infants) we shall have to rely on health visitors for certain information. There will be an average of only 25 cases per week for the whole city and Dr. White will write to the appropriate clinics enclosing a short questionnaire for each child included, asking for the following particulars:

Child's Christian name
Latest known address (if different from that on birth notification)
Legitimacy
Is the baby alive and home from hospital?
Length of gestation
Nature of any congenital defect found

Dr. White will be examining these children during the week in which they are four weeks old and we shall have to write to the mothers at least a week before that. The above information is needed before we can make our final choice of cases and so I am asking if you will please treat each request with great urgency and return the questionnaire in the stamped addressed envelope which will be provided.

Thank you for your help,

Yours sincerely,

I.D.G. Richards.

LETTER b.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH AND WELFARE DEPARTMENT

23 MONTROSE STREET,
GLASGOW, C.1
Tel: CEN. 9600
Extn. 2315
" 2418

Dear Sister,

The child described on the enclosed form may be included in my survey on Child Development. To enable me to select the sample children, who will be seen at the age of 4 weeks, some further information, not available from the Birth Notifications, is required. I would be grateful if you could supply the additional details requested and return the form to me, as soon as possible, in the enclosed stamped addressed envelope.

Thank you for your help,

Yours sincerely,

Elizabeth White.

Elizabeth White.

LETTER c.

SOCIAL PAEDIATRIC RESEARCH GROUP, 23 MONTROSE STREET, GLASGOW, C.1.

STUDY OF CHILD DEVELOPMENT.

Index No:	D.O.B.	
Surname:	Sex:	Birth Weight:
Registered Address:		
Place of Birth:		

ADDITIONAL INFORMATION REQUESTED.

Child's Forename:	
Child's Present Address: (if different from above)	
Legitimacy:	Legitimate/Illegitimate
Maturity at Birth:	(weeks gestation)
Age of Child at discharge from Maternity Hospital:	
Subsequent Admission to Hospital:	Yes/No. (Specify reason)
Congenital Defect:	Absent/Present. (Specify)
Child's Condition at Present: (Please tick)	Alive and well. Alive with congenital defect. Alive but in-patient in hospital Dead.

LETTER d.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH AND WELFARE DEPARTMENT

23 MONTROSE STREET
GLASGOW, C.1
Tel.: 041 - 221 9600
Extn. 2215
Extn. 2418

11th. September, 1969.

Dear Sister,

I should be grateful if you would convey my thanks to the Child Welfare Health Visitors of your clinic for the help which they have given me over the last three months. The information which they provided was an essential part of the process of selecting a sample of children for the survey on Child Development which is now underway.

The selected children have been seen for the first time, at four weeks of age, and I hope to see them at intervals of twelve weeks until they reach the age of one year. If, during my visits, I notice any defects of development (or of general health) I will inform the Health Visitor concerned and encourage the mother to attend the clinic. I would like to stress that my visits are an "extra" and will not interfere (in any way) with the normal supervision of the children by the Health Visitors.

I enclose a list of the children in your area who are included in the sample. Thank you again for your help without which the selection of the sample would have been impossible.

Yours sincerely,

Elizabeth White

Elizabeth White.

LETTER e.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH AND WELFARE DEPARTMENT

23 MONTROSE STREET,
GLASGOW, C.1
Tel: CEN. 9600
Extn. 2315
" 2418

We are conducting an investigation of child development in Glasgow and would greatly appreciate your help. A member of my staff, Dr. Elizabeth White, is hoping to see a large number of young children in their homes to find out how they vary in their development.

The children we should like to see have been chosen at random and among them is

________________ (date of birth ________)

Dr. White could call on you

at ________ on ____________________________

and I hope this will be convenient. If this time is unsuitable would you please let us know and we shall be pleased to arrange another appointment.

Thank you very much.

Yours sincerely,

I.D.G. Richards.

LETTER f.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH ~~AND WELFARE~~ DEPARTMENT

23 MONTROSE STREET
GLASGOW, C.1
Tel.: 041 - 221 9600
~~Extn. 2215~~
~~Extn. 2418~~

Extn. 2296

When I visited you to see ________________
on ________________________, I made a provisional appointment to visit you again in three months time.

I could call on you on ____________________
at ________. If this is not convenient, I would be grateful if you could let me know and I will be pleased to make alternative arrangements.

Yours sincerely,

Elizabeth White.

LETTER 9.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH AND WELFARE DEPARTMENT

23 MONTROSE STREET,
GLASGOW, C.1
Tel: CEN. 9600
Extn. 2315
" 2418
Extn. 2296

17th August, 1970.

Dear Mrs. Fraser,

I would like to thank you for your cooperation during the last year. By visiting normal children in their homes, we hope to be able to assess the range and rate of normal development; this information might then be of value in the diagnosis and treatment of backward children.

As the mother of a normal child, your help has made our work possible and I have greatly enjoyed visiting you and your baby.

Thank you again for your help. I hope that all goes well with you in the future.

Yours sincerely,

Elizabeth White.

LETTER h.

UNIVERSITY OF GLASGOW
DEPARTMENT OF CHILD HEALTH

I. D. G. RICHARDS
M.D., D.P.H.

SOCIAL PAEDIATRIC RESEARCH GROUP

CORPORATION OF GLASGOW
HEALTH AND WELFARE DEPARTMENT

23 MONTROSE STREET,
GLASGOW, C.1
Tel: CEN. 9600
Extn. 2315
" 2418

Dear Dr.

Studies in Child Development

As part of our investigation of child development in Glasgow, Dr. Elizabeth White, a Research Fellow on my staff, is conducting a longitudinal study of a random sample of infants. She intends visiting the selected children at 12-weekly intervals from 4 weeks to 52 weeks in order to conduct a brief developmental and neurological examination. I am writing to let you know that among the children selected is

____

of ______________________

whom we understand to be one of your patients. If any abnormality is discovered in the course of the investigation we shall, of course, inform you at once.

Yours sincerely,

I.D.G. Richards.

APPENDIX 3

PERFORMANCE OF THE STUDY CHILDREN ON THREE DEVELOPMENTAL SCHEDULES.

4 WEEK EXAMINATION 168 Children

DEVELOPMENTAL SCREENING INVENTORY (Knobloch et al., 1966)

Age level - 4 weeks or less.

Test Item	Performance level of the study children			
	0	1	2	-
1. Regard toy only when it is brought in front of eyes	- -	2 1%	- -	166 99%
2. Can follow dangled toy to midline, not past it.	10 6%	60 36%	- -	98 58%
3. Drop toy put in hand at once.	- -	110 66%	- -	58 34%
4. Head sag forward if held sitting.	- -	2 1%	- -	166 99%
5. Asymmetric tonic-neck-reflex posture predominates.	No equivalent test			
6. Clear nose from bed in prone.	43 26%	36 21%	- -	89 53%
7. Both hands held tightly fisted. -	- -	74 44%	- -	94 56%
8. Hand clench as toy touched to it.	- -	168 100%	- -	- -
9. Impassive face.	No equivalent test			
10. Vague indirect regard.	No equivalent test			
11. Make small throaty noises.	21 13%	113 67%	34 20%	- -
12. Regard examiner's face and decrease activity.	- -	165 98%	3 2%	- -
13. Indefinite stare at surroundings.	- -	5 3%	163 97%	- -

Code for performance level of study children:

0 Has not reached this level of achievement

1 Observed to achieve this item.

2 Not observed to achieve this item, but mother reports that child can achieve it.

\- Higher level of achievement.

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT (Illingworth, 1962)

Age level - 4 weeks

Test item	Performance level of the study children 0	1	2	-
1. In ventral suspension, head often raised, elbows flexed, some extension of hips with flexion of the knees	4 2%	137 82%	- -	27 16%
2. Head lag not quite complete.	- -	3 2%	- -	165 98%
3. Back completely rounded when held in sitting.	- -	2 1%	- -	166 99%
4. Hands held predominantly closed.	- -	74 44%	- -	94 56%
5. Grasp reflex present.	- -	168 100%	- -	- -
6. Watches mother intently.	- -	165 98%	3 2%	- -
7. Follows dangling object to midline, less than 90°.	10 6%	60 36%	- -	98 58%
8. Quiets when bell rings.	- -	168 100%	- -	- -
9. Smiles.	41 24%	49 29%	78 47%	- -

STYCAR CHART. (Sheridan, 1971)

Age level - 4 to 6 weeks.

Test item	Performance level of the study children 0	1	2	-
1. Prone, lies with arms flexed away from body, momentarily lifts chin.	79 47%	78 46%	- -	11 7%
2. Supine, lies with head to one side, limbs on face side more extended.	No equivalent test.			
3. Pulled to sit, head lags.	- -	3 2%	- -	165 98%
4. Held in sitting, back in one curve.	- -	2 1%	- -	166 99%

Stycar chart - cont...

Test Items	Performance level of The Study Children			
	0	1	2	-
5. Hands fisted	-	74	-	94
		44%		56%
6. Ventral suspension, head in line with body, arms and legs semi-flexed	141	27	-	-
	84%	16%	-	-
7. Visually follows dangling ball at 6 to 8 in. through quarter circle, side to midline.	10	60	-	98
	6%	36%	-	58%
8. Stills, may turn eyes or head to small bell, rattle or voice 6 in. from ear.	-	168	-	-
	-	100%	-	-
9. Fixes eyes on mother's face when feeding or tending.	-	165	3	-
	-	98%	2%	-
10. Social smile present by 6 weeks	41	49	78	-
	24%	29%	47%	-
11. Cries in discomfort, coos responsively when pleased.	21	113	34	-
	13%	67%	20%	-

16 WEEK EXAMINATION 147 children

DEVELOPMENTAL SCREENING INVENTORY

Age level - 16 weeks

Test items	Performance level of the study children 0	1	2	-
1. Wave arms, move body at sight of toy, dangled if on back.	10 7%	92 63%	- -	45 30%
2. Regard (look at) toy in hand	13 9%	57 39%	- -	77 52%
3. Take toy to mouth when on back.	70 48%	77 52%	- -	- -
4. Head steady, set forward, sitting.	1 1%	92 63%	- -	54 36%
5. Symmetric postures predominate.	No equivalent test.			
6. Hold head 90°, look directly ahead in prone.	33 22%	8 5%	- -	106 72%
7. Scratch, finger, clutch at clothes.	1 1%	79 54%	67 45%	- -
8. Bring hands together in midline and play with own fingers.	- -	140 95%	7 5%	- -
9. Laugh out loud.	25 17%	8 5%	114 78%	- -
10. Excite, breath heavily in play.	147 100%	- -	- -	- -
11. Initiate smile just when people come up and stand beside him.	- -	145 99%	2 1%	- -
12. Recognize bottle just on sight.	22 15%	4 3%	121 82%	- -

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT

Age level - 16 weeks

Test items	Performance levels of the study children			
	0	1	2	-
1. Prone, chest off couch. Plane of face at an angle of 90° to couch.	41 28%	53 36%	- -	53 36%
2. Only slight head lag when pulled to sit.	- -	19 13%	- -	128 87%
3. Head wobble when body swayed in sitting position.	1 1%	92 63%	- -	54 36%
4. Hands come together in play.	- -	140 95%	7 5%	- -
5. Pulls dress over face.	1 1%	79 54%	67 45%	- -
6. Tries to grasp object.	10 7%	92 63%	- -	45 30%
7. Plays for long time with rattle placed in hand.	24 16%	98 67%	25 17%	- -
8. Anticipates and excites when feed prepared.	22 15%	4 3%	121 82%	- -
9. Interest in strange room.	- -	147 100%	- -	- -
10. Laughs	25 17%	8 5%	114 78%	- -

STYCAR CHART

Age level - 3 months

Test items	Performance level of the study children			
	0	1	2	-
1. Prone, rests on forearms, lifts head and upper chest, buttocks flat, legs extended.	41 28%	53 36%	- -	53 36%
2. Supine, head rests in midline, limbs move rhythmically.	No equivalent test.			
3. Pulled to sit, head held erect, upper spine straight, lumbar curve.	93 63%	54 37%	- -	- -

Stycar Chart - cont...

Test items	Performance level of the study children			
	0	1	2	-
4. Held standing, sags at knees.	-	34	-	113
	-	23%	-	77%
5. Hands loosely open.	1	146	-	-
	1%	99%	-	-
6. Hands brought together in finger play.	-	140	7	-
	-	95%	5%	-
7. Holds rattle briefly and moves towards face.	13	57	-	77
	9%	39%	-	52%
8. Follows dangling ball horizontally and (usually) vertically through half-circle at 8 to 10 inches.	3	17	-	127
	2%	12%	-	86%
9. Defensive blink present.	-	147	-	-
	-	100%	-	-
10. Attends to and (usually) turns towards nearby voice or meaningful sounds.	1	146	-	-
	1%	99%	-	-
11. Cries and coos appropriately.	13	98	36	-
	9%	67%	24%	-
12. Smiles.	-	147	-	-
	-	100%	-	-
13. Chuckles.	29	64	54	-
	20%	43%	37%	-
14. Quick social response to nearby friendly face.	1	41	105	-
	1%	28%	71%	-

28 WEEK EXAMINATION 154 children

DEVELOPMENTAL SCREENING INVENTORY

Age level - 28 weeks

Test items	Performance level of the study children			
	0	1	2	-
1. Reach and pick up or take toy with one hand only.	28 18%	126 82%	- -	- -
2. Transfer toy easily, hand to hand.	136 88%	18 12%	- -	- -
3. Bang toy up and down when sitting supported.	20 13%	134 87%	- -	- -
4. Lift head from bed if on back.	39 25%	115 75%	- -	- -
5. Sit if put on hard surface, leaning on hands.	36 23%	16 10%	- -	102 67%
6. Stand if chest held under arms.	61 40%	26 17%	- -	67 43%
7. Pick up small toy, hold to radial side of palm with 2nd and 3rd finger	13 8%	104 68%	- -	37 24%
8. Put whole hand on crumb, rake it.	32 21%	122 79%	- -	- -
9. Say "mum-mum-mum" especially crying	54 35%	2 1%	98 64%	- -
10. Make same vowel sound in series: "ah-ah-ah, uh-uh-uh, oh-oh-oh".	1 1%	97 63%	56 36%	- -
11. Feet to mouth when lying on back.	52 34%	1 1%	101 65%	- -
12. Reach out and pat self in put close to mirror.	83 54%	71 46%	- -	- -

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT

Age level - 28 weeks

Test Items	Performance level of the study children.			
	0	1	2	-
1. Prone - weight on one hand.	94 61%	60 39%	- -	- -
2. Lifts head spontaneously from supine not just when about to be pulled up.	39 25%	115 75%	- -	- -
3. Sits on floor with hands forward for support.	36 23%	16 10%	- -	102 67%
4. Bounces with delight when held standing.	87 57%	67 43%	- -	- -
5. Transfers object hand to hand.	136 88%	18 12%	- -	- -
6. Unidextrous.	28 18%	126 82%	- -	- -
7. Feeds self with biscuit.	48 31%	3 2%	103 67%	- -
8. Bangs bricks on table.	20 13%	134 87%	- -	- -
9. Holds first cube when given another.	43 28%	111 72%	- -	- -
10. Pats image of self in a mirror	83 54%	71 46%	- -	- -
11. Imitation beginning.	26 17%	24 16%	83 54%	21 13%
12. Expectation in response to repitition of stimulus.	2 1%	65 42%	82 54%	5 3%
13. Tries to attract attention by a cough.	1 1%	29 19%	124 80%	- -
14. "Ba,da,ka". Four or more different sounds.	52 34%	41 26%	61 40%	- -

STYCAR CHART

Age level - 6 months.

Test items	Performance level of the study children.			
	0	1	2	-
1. Prone, lifts head and chest, supported on extended arms.	22 14%	72 47%	- -	60 39%
2. Can roll over.	82 53%	36 23%	36 23%	- -
3. Supine, lifts up head from pillow.	39 25%	115 75%	- -	- -
4. Supine, brings legs into vertical and grasps foot.	52 34%	1 1%	101 65%	- -
5. When hands held, pulls self to sit, head erect back straight.	23 15%	119 77%	- -	12 8%
6. Sits with support.	36 23%	16 10%	- -	102 67%
7. Held standing takes weight on legs.	61 40%	26 17%	- -	67 43%
8. Reaches for toys.	28 18%	126 92%	- -	- -
9. Takes everything to mouth.	8 5%	146 95%	- -	- -
10. Uses whole hand in palmar grasp.	- -	13 8%	- -	141 92%
11. Transfers objects from one hand to the other.	136 88%	18 12%	- -	- -
12. Visually attentive for near events.	- -	120 78%	34 22%	- -
13. Visually attentive for distant events.	8 5%	- -	146 95%	- -
14. Vocalizes tunefully, using single and double syllables.	52 34%	41 26%	61 40%	- -
15. Laughs.	93 60%	30 20%	31 20%	- -
16. Chuckles.	19 12%	3 2%	132 86%	- -

Stycar chart - cont..

Test Items	Performance level of the study children			
	0	1	2	-
17. Squeals.	9	11	134	-
	6%	7%	87%	-
18. Visually localizes voiced sounds at 18 in. on ear level.	4	150	-	-
	3%	97%	-	-
19. Socially forthcoming, continually active, alert and curious.	-	154	-	-
	-	100%	-	-

<u>40 WEEK EXAMINATION</u> <u>Main sample - 153 children</u>

DEVELOPMENTAL SCREENING INVENTORY

Age level - 40 weeks

Test item	Performance level of the children of the main sample			
	0	1	2	-
1. Play inside cup with toy you put there, touch and manipulate it.	5 3%	19 12%	- -	129 85%
2. Hold small toy and try to or pick up crumb at same time.	No equivalent test			
3. Poke with index finger at things.	149 97%	5 3%	- -	- -
4. Sit erect and steady indefinitely.	8 5%	145 95%	- -	- -
5. Go, not fall, forward into prone.	61 40%	92 60%	- -	- -
6. Crawl (creep) on hands and knees.	108 71%	31 20%	- -	14 9%
7. Pulls self to standing.	90 59%	63 41%	- -	- -
8. Put small toy down, take hands off.	31 20%	110 72%	- -	12 8%
9. Pluck crumb up promptly, usually with thumb and index finger.	6 4%	93 61%	- -	54 35%
10. Say and mean "ma-ma" and "da-da".	126 82%	4 3%	23 15%	- -
11. Have one other word.	151 99%	- -	2 1%	- -
12. Play nursery trick just if asked,	113 74%	17 11%	23 15%	- -
13. Play nursery trick only if you do it first; does not understand meaning of words (does above).	25 16%	28 18%	83 55%	17 11%

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT

Age level - 40 weeks

Test Items	Performance level of the children of the main sample			
	0	1	2	-
1. Crawls (on abdomen).	81 53%	14 9%	- -	58 38%
2. Goes into prone from sitting position.	61 40%	92 60%	- -	- -
3. Pulls self to sit.	56 37%	97 63%	- -	- -
4. Can pick up pellet between finger tip and thumb.	99 65%	54 35%	- -	- -
5. Index finger approach.	149 97%	5 3%	- -	- -
6. Offers brick to mother but will not let go.	23 15%	110 72%	- -	20 13%
7. Looks round corner for object.	55 36%	98 64%	- -	- -
8. Pulls mother's clothes to attract attention.	- -	3 2%	150 98%	- -
9. Waves 'bye-bye'.	65 42%	7 5%	81 53%	- -
10. Plays 'Patacake'.	25 16%	28 18%	83 65%	17 11%
11. Repeats performance laughed at.	52 34%	6 4%	95 62%	- -

STYCAR CHART

Age level - 9 months.

Test Items	Performance level of the children of the main sample			
	0	1	2	-
1. Sits alone for 10 to 15 minutes on the floor.	4 3%	4 3%	- -	145 94%
2. Can stand holding on to support but cannot lower himself.	89 58%	18 12%	- -	46 30%

Stycar Chart ...Cont.

Age level - 9 months

Test Items	Performance level of the children of the main sample			
	0	1	2	-
3. Reaches immediately for toys and manipulates them.	3 2%	150 98%	- -	- -
4. Still takes everything to mouth.	- -	147 96%	- -	6 4%
5. Pokes at small pellet with index finger.	149 97%	5 3%	- -	- -
6. Grasps between finger and thumb in scissor fashion.	6 4%	93 61%	- -	54 35%
7. Throws toys to ground deliberately.	92 60%	61 40%	- -	- -
8. Looks for fallen toy and (sometimes) for toy hidden before his eyes.	55 36%	98 64%	- -	- -
9. Visual attention for near events.	- -	153 100%	- -	- -
10. Visual attention for distant events.	- -	5 3%	148 97%	- -
11. Brisk localization of quiet, meaningful sounds and voice at 3 ft. above and below ear level.	3 2%	150 98%	- -	- -
12. Babbles in long repetative strings of syllables.	59 39%	43 28%	51 33%	- -
13. Feeds himself with a biscuit.	- -	2 1%	151 99%	- -
14. Chews.	25 16%	- -	128 84%	- -
15. Distinguishes between familiars and strangers.	1 1%	- -	152 99%	- -

40 WEEK EXAMINATION   Preliminary sample - 97 children

DEVELOPMENTAL SCREENING INVENTORY.

Age level - 40 weeks

Test items	Performance level of the children of the preliminary sample							
	0		1		2		-	
D.1	4	4%	15	16%	-	-	78	80%
D.2	No equivalent test.							
D.3	95	98%	2	2%	-	-	-	-
D.4	6	6%	91	94%	-	-	-	-
D.5	4	4%	93	93%	-	-	-	-
D.6	52	54%	35	36%	-	-	10	10%
D.7	32	33%	57	59%	-	-	8	8%
D.8	53	55%	34	35%	-	-	10	10%
D.9	3	3%	58	60%	-	-	36	37%
D.10	Results not reliable							
D.11	Results not reliable							
D.12	57	59%	8	8%	32	33%	-	-
D.13	16	17%	35	36%	38	39%	8	8%

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT

Age level - 40 weeks.

Test items	Performance level of the children of the preliminary sample							
	0		1		2		-	
I.1	27	28%	10	10%	-	-	60	62%
I.2	4	4%	93	96%	-	-	-	-
I.3	9	9%	88	91%	-	-	-	-
I.4	61	63%	36	37%	-	-	-	-
I.5	95	98%	2	2%	-	-	-	-
I.6	18	19%	48	49%	-	-	31	32%

Illingworth's Schedule of Normal Development ...Cont

Age level - 40 weeks.

Test items	Performance level of the children of the preliminary sample							
	0		1		2		-	
I.7	20	21%	77	79%	-	-	-	-
I.8	19	20%	16	16%	62	64%	-	-
I.9	25	26%	6	6%	66	68%	-	-
I.10	16	16%	35	36%	38	39%	8	8%
I.11	24	25%	8	8%	65	67%	-	-

STYCAR CHART

Age level - 9 months

Test items	Performance level of the children of the preliminary sample							
	0		1		2		-	
S.1	3	3%	3	3%	-	-	91	94%
S.2	35	36%	23	24%	-	-	39	40%
S.3	-	-	97	100%	-	-	-	-
S.4	1	1%	92	95%	-	-	4	4%
S.5	95	98%	2	2%	-	-	-	-
S.6	3	3%	58	60%	-	-	36	37%
S.7	72	74%	25	26%	-	-	-	-
S.8	20	21%	77	79%	-	-	-	-
S.9	-	-	96	99%	1	1%	-	-
S.10	-	-	-	-	97	100%	-	-
S.11	2	2%	95	98%	-	-	-	-
S.12	1	1%	77	79%	19	20%	-	-
S.13	-	-	3	3%	94	97%	-	-
S.14	8	8%	-	-	89	92%	-	-
S.15	3	3%	1	1%	93	96%	-	-

52 WEEK EXAMINATION — Main sample - 144 children

DEVELOPMENTAL SCREENING INVENTORY

Age level - 52 weeks

Test items	Performance level of the children of the main sample			
	0	1	2	-
1* Try piling one small toy on 2nd just presses or it falls off.	39 28%	70 50%	- -	31 22%
2* Put toy in cup or box if you show him first each time.	2 1%	25 18%	- -	113 81%
3* Dangle toy by string, deliberate.	55 39%	85 61%	- -	- -
4. Walk with only one hand held.	58 40%	48 33%	- -	38 27%
5. Say 2 "words" plus ma-ma and da-da.	70 49%	16 11%	58 40%	- -
6* Let go of toy into your hand if you hold hand out for it.	8 6%	132 94%	- -	- -
7. Help in dressing - push arm through sleeve if you get it started.	78 54%	1 1%	65 45%	- -
8* Offer toy to own mirror image.	56 40%	84 60%	- -	- -

* Only 140 children included for items marked *

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT

Age level - 52 weeks

Test Items	Performance level of the children of the main sample			
	0	1	2	-
1. Walks on hands and feet.	90 63%	44 30%	- -	10 7%
2. Walks - one hand held.	58 40%	48 33%	- -	38 27%
3. Mouthing nearly stopped.	65 46%	75 54%	- -	- -
4. Beginning to cast - throws objects to the floor.	23 16%	117 84%	- -	- -
5. Said to use 2 to 3 words with meaning.	70 49%	16 11%	58 40%	- -

STYCAR CHART

Age level - 12 months

Test items	Performance level of the children of the main sample			
	0	1	2	-
1. Sits well.	-	144	-	-
	-	100%	-	-
2. Can rise to sitting position from lying down.	13	131	-	-
	9%	91%	-	-
3. Crawls rapidly on all fours.	28	62	-	54
	19%	43%	-	38%
4. Walks with hand(s) held.	58	48	-	38
	40%	33%	-	27%
5. Can pull to stand....	14	95	-	35
	10%	66%	-	24%
6. .... and let himself down again.	7	33	-	104
	5%	23%	-	72%
7* Casts objects to floor repeatedly.	23	117	-	-
	16%	84%	-	-
8* Retrieves toy hidden before his eyes under cup or cushion.	12	128	-	-
	9%	91%	-	-
9. Demonstrates sustained visual interest in near events.	-	143	1	-
	-	99%	1%	-
10. Demonstrates sustained visual interest for distant events.	-	1	143	-
	-	1%	99%	-
11. Brisk response to quiet sounds but soon habituates.	3	141	-	-
	2%	98%	-	-
12. Knows and turns to own name.	-	143	1	-
	-	99%	1%	-
13. Jargons tunefully, loudly and insistently.	5	96	43	-
	3%	67%	30%	-
14. Comprehends simple commands.	106	2	36	-
	74%	1%	25%	-
15. Holds spoon but cannot use it alone.	11	72	61	-
	8%	50%	42%	-
16. Drinks from cup with help.	-	-	21	123
	-	-	15%	85%
17. Co-operates in dressing by holding out limbs.	78	1	65	-
	54%	1%	45%	-
18. Mother reports very dependent upon familiar adults.	92	52	-	-
	64%	36%	-	-

40 WEEK EXAMINATION — Preliminary sample - 70 children

DEVELOPMENTAL SCREENING INVENTORY

Age level - 52 weeks

Test Items	Performance level of the children of the preliminary sample							
	0		1		2		-	
D.1	12	17%	34	49%	-	-	24	34%
D.2	-	-	11	16%	-	-	59	84%
D.3	55	79%	15	21%	-	-	-	-
D.4	21	30%	18	26%	-	-	31	44%
D.5	24	34%	7	10%	38	54%	1	1%
D.6	-	-	70	100%	-	-	-	-
D.7	29	41%	1	1%	40	57%	-	-
D.8	21	30%	49	70%	-	-	-	-

ILLINGWORTH'S SCHEDULE OF NORMAL DEVELOPMENT

Age level - 52 weeks

Test Items	Performance level of the children of the preliminary sample							
	0		1		2		-	
I.1	24	34%	41	59%	-	-	5	7%
I.2	21	30%	18	26%	-	-	31	44%
I.3	3	4%	67	96%	-	-	-	-
I.4	34	49%	36	51%	-	-	-	-
I.5	24	34%	7	10%	38	54%	1	1%

STYCAR CHART

Age level - 12 months

Test Items	Performance level of the children of the preliminary sample							
	0		1		2		-	
S.1	-	-	70	100%	-	-	-	-
S.2	6	9%	64	91%	-	-	-	-
S.3	10	14%	14	20%	-	-	46	66%
S.4	21	30%	18	26%	-	-	31	44%
S.5	8	11%	62	89%	-	-	-	-
S.6	6	9%	15	21%	-	-	49	70%
S.7	34	49%	36	51%	-	-	-	-
S.8	1	1%	69	99%	-	-	-	-
S.9	-	-	69	99%	1	1%	-	-
S.10	-	-	3	4%	67	96%	-	-
S.11	1	1%	69	99%	-	-	-	-
S.12	-	-	68	97%	2	3%	-	-
S.13	3	4%	55	79%	12	17%	-	-
S.14	28	40%	3	4%	39	56%	-	-
S.15	7	10%	-	-	21	30%	42	60%
S.16	1	1%	-	-	12	17%	57	82%
S.17	29	41%	1	1%	40	57%	-	-
S.18	52	74%	18	26%	-	-	-	-

APPENDIX 4

TEST ITEMS INCLUDED IN THE

DEVELOPMENTAL SCORES

PHYSICAL SCORE

Items from Form 2.

Traction Response

Resistance in arms   0 Normal   1 Low   2 High

Head lag
0 Complete
1 Incomplete
2 No head lag
3 Lifts head spontaneously when being pulled up
4 Lifts head spontaneously when about to be pulled up
5 Lifts head spontaneously from supine
- Higher level of development

Sitting

Held in sitting
0 No head control; back curved
1 Head erect momentarily
2 Head held steady, set forward; head wobble when swayed.
3 Head held steady, erect; thoracic spine straight.
4 Back straight, no head wobble when swayed.

Prone

Position of head
0 To one side
1 Head midline, slightly up
2 Face at 45° to couch momentarily.
3 Face maintained at 45° to couch.
4 Face at 90° to couch momentarily.
5 Face maintained at 90° to couch.
6 Head and chest up, supported on forearms.
7 Head and chest up, supported on one forearm and one extended arm.
8 Head and chest well up, supported on extended arms.
9 Head and chest well up, supported on one arm.
- Higher level of development.

Arms
0 Under chest
1 Out, stationary on table, hands clenched.
2 Out, stationary on table, hands open.
3 Out, hands scratching at table surface.
- Higher level of development.

Pelvis
0 High
1 Intermediate.
2 Flat
- Higher level of development.

Legs 0 Knees drawn up under abdomen
1 Intermittently kicks out
2 Legs held extended
- Higher level of development

Can roll from prone to supine 0 No; 1 Yes(O); 2 Yes (H)

Can roll from supine to prone 0 No; 1 Yes(O); 2 Yes(H)

Ventral Suspension

Head 0 Droops
1 In plane of body momentarily
2 Maintained in plane of body
3 Above plane of body
4 Maintained well above plane of body

Arms 0 Flexed
1 Partly extended
2 Extended
3 Moving
4 Hanging limply

Legs 0 Flexed
1 Partly extended
2 Extended
3 Moving
4 Hanging limply

Landau response 0 Present 1 Absent

Trunk elevating response 0 Present 1 Absent

Parachute response 0 Present 1 Absent

Vertical Suspension

Head 0 Flops
1 Held erect intermittently
2 Held erect

Legs 0 Semi flexed
1 Extended
2 Moving
3 Held at right angles to body
4 Fixed extension with adduction or scissoring

Positive Supporting

0 Involuntary weight bearing (knees flexed)
1 Bears no weight, knees sag
2 Bears some weight (Knees extended voluntary) on toes
3 Bears some weight (knees extended voluntary) on flat of foot
4 Bears almost all weight
5 Bounces with delight
- Higher level of development

Placing response 0 Present 1 Absent

Stepping reaction 0 Present 1 Absent

<u>Tonic Neck Reflex</u>

0 Adopted spontaneously
1 Imposable
2 Imposable and obligate
3 Not imposable

<u>Neck Righting Reflex</u>

0 Imposable
1 Imposable and obligate
2 Not imposable

<u>Moro Response</u>

0 Complete, with abduction and extension
1 Complete, but very easily elicited
2 Incomplete, flexion with adduction only
3 Absent

Response symmetrical 0 Yes 1 No - n.a.

Tremor 0 Absent 1 Slight 2 Marked - na.

<u>Withdrawal Reflex</u> 0 Present 1 Absent

<u>Plantar Grasp</u>

0 Present symmetric
1 Present asymmetric
2 Present weak
3 Absent

SIT WALK SCORE

Items from Form 2

Mobility
0 No apparent attempt to travel
1 Vigorous swimming movements
2 Pivots in a circle using arms
3 Progresses by rolling
4 Progresses by squirming backwards
5 Progresses by squirming forwards
6 Single "hitch"
7 Double "hitch"
8 Creeps on hands and knees
9 Creeps sole of foot intermittently on couch
- Higher level of development.

Items from Form 3

Sitting

Sits with support on settee, etc.
Sits with support on settee and can turn head side to side
Sits on floor with hands forward for support
Sits seconds on floor without support
Sits 10 minutes on floor without support
Sits well and for indefinite time

Can lean forward and recover balance
Can lean to side and recover balance

Can go into prone from sitting
Can get to sitting from prone
Can pull himself to sit
Can sit up unaided

Standing and Walking

Stands when hands held at shoulder-height
When held standing steps on alternate feet
Walks if hands held at shoulder height
Walks if one hand held

Stands holding onto furniture
Stands at furniture, lifts feet up and down
Sidesteps around furniture
Walks holding onto furniture with one hand only

Can stand alone momentarily
If standing, takes few steps and falls
Walks alone unsteadily, arms high
Walks well

Pulls self to standing
Can get to feet alone

Lets himself down from standing with a bump
Lets himself down from standing gently, with support.

Lets himself down from standing gently

Can climb on ledge or step
Crawls upstairs
Walks upstairs, hand held
Walks upstairs holding onto wall
Gets downstairs (by any method)

Can kneel with support on floor
Can kneel without support on floor

TOTAL PHYSICAL SCORE

All items included in the Physical and Sit Walk scores were also included in the Total Physical score.

HAND EYE SCORE

Items from Form 2

Hands

Held	0	Clenched, thumb in
	1	Clenched, thumb out
	2	Mostly open
To mouth	0 No	1 Yes (O) 2 Yes (H)
Hand regard	0 No	1 Yes (O) 2 Yes (H)
Together in midline in play	0 No	1 Yes (O) 2 Yes (H)
Pulls dress over face	0 No	1 Yes (O) 2 Yes (H)
Grasps toes in supine	0 No	1 Yes (O) 2 Yes (H)
Pulls feet to mouth	0 No	1 Yes (O) 2 Yes (H)
Palmar grasp	0	Present symmetric
	1	Present asymmetric
	2	Present weak
	3	Absent
	-	n.a.
Voluntary grasp	0	Drop toy put in hand at once
	1	Retain briefly toy put in hand
	2	Retain toy long enough to glance at it
	3	Retain toy long enough to regard it
	4	Takes toy to mouth
	-	Higher level of development

Vision

Pupils	0 Equal	1 Unequal
Pupillary reaction	0	Present, equal
	1	Present right, absent left
	2	Present left, absent right
	3	Absent both
Blink response	0 Present	1 Absent - n.a.
Follows pencil torch at 1 foot	0 Yes	1 No - na.
Dangled toy	0	No reaction
	1	Regards it only when brought in front of eyes
	2	Delayed regard at 4-6"
	3	Prompt regard at 4-6"
	4	Excited, waving etc. at toy
	5	Brings both hands up to toy
	-	Higher level of development

Moving Toy

0 No reaction
1 Regards briefly, does not follow
2 Follows to midline (90°)
3 Follows past midline
4 Follows side-to-side
5 Follows vertically
6 Follows in a circle
- Higher level of development.

TABLE TOP SCORE

Items from Form 4

Cubes

Grasps cube only if given to him
Reaches and picks up cube with both hands
Reaches and picks up cube with one hand only

Holds cube in centre of palm with all fingers
Holds cube to radial side of palm
Picks up and holds cube with ends of fingers

Puts cube in mouth
Holds one cube and looks at second one offered
Drops one cube when offered another
Holds first cube when given another
Holds two cubes and looks at third one offered
Drops one of two cubes held to take third one

Bangs cube up and down when sitting
Transfers cube easily hand to hand
Hits cube in hand at cube on table
Picks up one cube and then another
Holds two cubes prolongedly
"Compares" two cubes
Some constructive play with massed cubes

Reach for cube dropped within reach
Persists in reaching for cubes out of reach
Looks after falling cubes
Searches in correct place for dropped cube

Drops cubes deliberately and watches them fall
Throwing toys on floor, for them to be picked up

Will 'give' cube to adult but not release it
Can release cube against table but not put it down
Can put cube down, lift hands off

Tries unsuccessfully to build 'tower of two' if shown
Can build 'tower of two' if shown

Can pick up two small objects in one hand in play

Cup

Pushes at it
'Examines' it
Demonstrates that he knows its use

Cup and Cubes

Pokes at cubes in cup, plays with it but doesn't remove it
Will remove cube from cup
Tips cube out of cup
Will put cube into cup if shown but not release it
Will put cube into cup and release, if shown

Spontaneously puts cubes into cup
Plays constructively with cubes in and out of cup

__Pellet__

Looks at pellet with interest, does not touch it
Knocks pellet off table with sweeping movements
Scooping two-handed approach to pellet
Raking one-handed approach to pellet
Secures pellet any method
Grasps pellet between finger and thumb, forearm supported on table
Precise pincer grasp.

__Pellet in bottle__

Looks at pellet only if it drops out of bottle
Points at pellet through glass
Shakes pellet out of bottle

__Pellet and bottle__

Grasps pellet only
If shown, tries to insert pellet in bottle, fails
If shown, can insert pellet in bottle
Inserts pellet in bottle, spontaneously

__Bell__

Two-handed approach, held anyhow
Handle grasped, low down, with one hand
Attempts to imitate ringing action
Grasps bell neatly by handle, pokes clapper
"Drinks" from cup of bell
Rings bell briskly in imitation

__Ring and string__

Reaches for ring repeatedly, doesn't try to secure it by string
Reaches for ring repeatedly then secure it by string
Secures ring by string immediately
Holds ring in one hand and play with string with other
Dangles ring by string immediately

__Mirror__

No reaction to mirror image
Regards mirror image intently
Smiles at mirror image
Smiles and talks to self if close to mirror
Pats image of self in mirror
Reaches for image of toy in mirror
Offer toy to image of self

__Drawing__

Makes 'Jabbing' marks on paper in imitation of scribble
Imitates scribble
Tries to imitate stroke

Picture book

Looks with interest at pictures in book
'Helps' turn pages of book
Looks with interest and pats at pictures in book

Formboard

Attempts to insert round block, if shown
Succeeds in inserting round block, if shown
Inserts round block promptly without demonstration

Ball play

Looks at ball rolled towards him
Attempts to grasp ball rolled towards him
Succeeds in grasping ball rolled towards him
Using a 'casting' motion will attempt to throw ball to adult

TOTAL HAND EYE SCORE

All items included in the Hand Eye and Table Top scores were also included in the Total Hand Eye Score.

SOCIAL SCORE

Items from Form 3

General understanding and social behaviour

Smiles when spoken to
Smiles spontaneously at adults or children

Smiles and vocalizes when spoken to or pleased
Imitates 'conversation' with toys or people

Shouts to attract attention
Pulls adult's clothes to attract attention
Makes wishes and needs known by grunts, gestures, etc.

'Appreciates' nursery games
Plays nursery games after demonstration
Plays nursery games if asked
Repeats performance laughed at

Knows and turns to own name
Understands 'no'
Understands 'bye-bye' or 'ta-ta'
Understands and obeys simple commands
Points to familiar persons, etc. if asked
Understands several words in usual context

Helps with dressing by holding out arms for sleeves
Helps with dressing by holding out feet for shoes
Helps more constructively with dressing

Visual interest

Indefinite stare at window or blank wall
Interest in surroundings
Glances one object to another

Eyes follow moving person
Watches activities of people at 10-12' with interest
Watches events in street intently

Watches adult's face intently
Visually recognizes mother
Recognizes family and friends

Auditory awareness

Stops whimpering when spoken to
Quietens at sounds of mother's approach, before she can be seen
Appropriate respons (or excitement) to household noises
Selectively recognizes mother's voice
Shakes rattle deliberately to make it sound, may look at it earnestly while doing so.

Vocalization

* Gutteral noises, other than crying
* Single vowels (ah, eh, uh)
* 'Mum-mum-mum' especially when crying
* Some vowel sounds in series (ahah-ah, eh-eh-eh)
* Vocalizes tunefully, using single syllable with consonant (da, ba, goo)
* Babbles tunefully repeating syllables in strings (mama, baba, - meaningless)
* Jabbers freely, using a wide range of inflections and phonetic units (jargon)

Says 'dada' or 'mama' with meaning
Says 'dada' or 'mama' and one or two other words
Says 'dada' or 'mama' and $>$ two other words

Tries to imitate adults' playful sounds
Imitates adult's playful sounds with obvious delight

Chuckles
Laughs out loud
Squeals with pleasure
Screams with annoyance
Grunts and growls with effort

Feeding behaviour

Quietens at sight of bottle
Obvious excitementat sight of bottle
Reaches out to proffered bottle

Pats bottle when feeding
Puts hands round bottle when feeding
Drinks from cup with assistance
Holds cup to drink, if adult gives cup and takes it away
Will drink from cup and throw it away when satisfied
Will drink from cup and put it down when satisfied

Tries to grasp spoon when being fed
Holds spoon, but cannot use it alone
Attempts to use spoon, licks it but turns it over
Feeds himself with spoon

Takes everything to mouth
Bites and chews on biscuit or rusk
Chews solids well
Shows obvious likes and dislikes of food

The items marked * were excluded from the Social score of the preliminary sample at 40 weeks.

APPENDIX 5

DISTRIBUTION OF THE DEVELOPMENTAL SCORES

TOTAL PHYSICAL, PHYSICAL AND SIT WALK SCORES.

Main sample - 4 week examination

Total Physical score.

Score	Number of children
54 -	2
56 -	11
58 -	16
60 -	26
62 -	34
64 -	46
66 -	21
68 -	9
70 -	0
72 - 74	3
	168

Range: 54.0 - 73.7

Mean: 63.4

S.D.: 3.47

Main sample - 16 week examination

Total Physcial score		Physical score		Sit Walk score	
Score	No. of children	Score	No. of children	Score	No. of children
35 -	1	30 -	1	1.4	9
40 -	3	35 -	1	2.1	6
45 -	12	40 -	6	2.2	45
50 -	38	45 -	26	3.0	53
55 -	47	50 -	39	3.7	19
60 -	39	55 -	61	4.5	15
65 -	6	60 -	11		147
70 - 75	1	65 - 70	2		
	147		147		

Range: 35.1 - 70.8 Range:33.7 - 66.3 Range: 1.4 - 4.5
Mean: 56.8 Mean: 54.0 Mean: 2.9
S.D.: 5.83 S.D.: 5.48 S.D.: 0.82

Main sample - 28 week examination.

Total Physical score		Physical score		Sit Walk score	
Score	No. of children	Score	No. of children	Score	No. of children
70 -	4	34 -	1	36 -	34
75 -	6	36 -	3	38 -	33
80 -	21	38 -	0	40 -	19
85 -	43	40 -	5	42 -	32
90 -	37	42 -	7	44 -	19
95 -	30	44 -	13	46 -	14
100 -	12	46 -	25	48 -	2
105 - 110	1	48 -	27	50 - 52	1
	154	50 -	31		154
		52 -	24		
		54 - 56	18		
			154		

Range: 73.1 - 105.9 Range: 35.4 - 57.8 Range: 36.6 - 50.0
Mean: 89.4 Mean: 49.2 Mean: 41.3
S.D.: 7.23 S.D.: 4.17 S.D.: 3.40

Main sample - 40 week examination

Total Physical score

Score	No. of children
70 -	1
80 -	2
90 -	11
100 -	41
110 -	47
120 -	48
130 - 140	3
	153

Range: 74.2 - 131.3
Mean: 113.6
S.D.: 10.45

Physical score

Score	No. of children
42 -	1
45 -	0
48 -	0
51 -	0
54 -	0
57 -	4
60 -	4
63 -	12
66 -	25
69 -	40
72 - 75	66
	153

Range: 44.9 - 73.7
Mean: 69.8
S.D.: 4.17

Sit Walk score

Score	No. of children
27 -	3
30 -	1
33 -	19
36 -	22
39 -	27
42 -	16
45 -	14
48 -	18
51 -	20
54 -	10
57 - 60	3
	153

Range: 27.8 - 58.2
Mean: 43.8
S.D.: 6.98

Preliminary sample - 40 week examination

Total Physical score

Score	No. of children
80 -	1
85 -	1
90 -	2
95 -	8
100 -	6
105 -	14
110 -	17
115 -	35
120 -	11
125 - 130	2
	97

Range: 84.3 - 127.1
Mean: 112.4
S.D.: 8.85

Physical score

Score	No. of children
57 -	3
60 -	1
63 -	14
66 -	24
69 -	54
72 - 75	1
	97

Range: 58.1 - 72.8
Mean: 68.6
S.D.: 3.00

Sit Walk score

Score	No. of children
24 -	2
27 -	0
30 -	3
33 -	7
36 -	9
39 -	14
42 -	14
45 -	21
48 -	19
51 -	7
54 - 57	1
	97

Range: 26.2 - 55.7
Mean: 43.6
S.D.: 6.26

Main sample - 52 week examination

Total Physcial score Score	No. of children
80 -	1
85 -	0
90 -	4
95 -	5
100 -	9
105 -	18
110 -	35
115 -	37
120 -	18
125 -	13
130 - 135	3
	143

Range: 84.8 - 131.7
Mean: 114.2
S.D.: 8.72

Physical score Score	No. of children
62 -	2
63 -	0
64 -	3
65 -	0
66 -	0
67 -	7
68 -	17
69 -	5
70 -	92
71 -	15
72 -	0
73 - 74	2
	143

Range: 62.2 - 73.3
Mean: 70.0
S.D.: 1.63

Sit Walk score Score	No. of children
20 -	2
25 -	2
30 -	13
35 -	19
40 -	42
45 -	30
50 -	23
55 - 60	12
	143

Range: 22.5 - 59.8
Mean: 44.2
S.D.: 7.45

Preliminary Sample - 52 week examination

Total Physical score Score	No. of children
85 -	1
90 -	1
95 -	3
100 -	4
105 -	9
110 -	18
115 -	22
120 -	11
125 - 130	3
	72

Range: 88.8 - 127.1
Mean: 113.7
S.D.: 8.15

Physical score Score	No. of children
62 -	1
64 -	1
66 -	6
68 -	13
70 -	47
72 - 74	4
	72

Range: 62.9 - 72.2
Mean: 69.8
S.D.: 1.51

Sit Walk score Score	No. of children
25 -	4
30 -	5
35 -	9
40 -	19
45 -	20
50 - 55	15
	72

Range: 25.2 - 54.8
Mean: 43.8
S.D.: 7.03

TOTAL HAND EYE, HAND EYE AND TABLE TOP SCORES.

Main sample - 4 week examination

Total Hand Eye Score

Score	Number of children
24 -	1
26 -	4
28 -	32
30 -	62
32 -	48
34 -	15
36 - 38	6
	168

Range: 24.4 - 37.0
Mean: 31.7
S.D.: 2.14

Main sample - 16 week examination

Total Hand Eye score		Hand Eye Score		Table Top score	
Score	No. of children	Score	No. of children	Score	No. of children
24 - 26	1	15 - 16	1	9 - 10	1
...		...		...	
36 -	1	23 -	4	12 -	2
38 -	3	24 -	2	13 -	3
40 -	13	25 -	2	14 -	23
42 -	29	26 -	13	15 -	35
44 -	33	27 -	16	16 -	16
46 -	47	28 -	22	17 -	41
48 -	14	29 -	59	18 -	14
50 -	4	30 -	10	19 -	4
52 - 54	2	31 - 32	18	20 -	5
	147		147	21 - 22	3
					147

Range: 24.3 - 52.7	Range : 15.1 - 31.2	Range: 9.2 - 21.7
Mean: 45.4	Mean: 28.7	Mean: 16.6
S.D.: 3.98	S.D.: 2.03	S.D.: 1.80

Main sample - 28 week examination

Total Hand Eye Score		Hand Eye score		Table Top score	
Score	No. of children	Score	No. of children	Score	No. of children
85 -	1	22 -	1	64 -	1
90 -	1	23 -	0	67 -	2
95 -	5	24 -	1	70 -	6
100 -	15	25 -	5	73 -	6
105 -	28	26 -	5	76 -	12
110 -	38	27 -	129	79 -	22
115 -	56	28 - 29	13	82 -	21
120 - 125	10		154	85 -	25
	154			88 -	38
				91 -	17
				94 - 97	4
					154
Range: 89.8 - 124.0		Range: 22.5 - 28.2		Range: 64.2 - 96.1	
Mean: 112.3		Mean: 27.6		Mean: 84.6	
S.D.: 6.62		S.D.: 0.70		S.D.: 6.24	

40 week examination - Total Hand Eye score

Score	Main Sample No. of children	Preliminary Sample No. of children
50 -	1	1
55 -	3	1
60 -	0	1
65 -	8	3
70 -	15	7
75 -	27	12
80 -	23	27
85 -	39	27
90 -	23	15
95 -	10	3
100 -	3	0
105 - 110	1	0
	153	97
Range:	51.7 - 108.0	51.8 - 99.4
Mean:	83.3	83.0
S.D.:	9.54	8.11

52 week examination - Total Hand Eye score

	Main sample	Preliminary sample
Score	No. of children	No. of children
45 -	1	0
50 -	0	0
55 -	0	0
60 -	1	1
65 -	4	1
70 -	9	6
75 -	13	5
80 -	34	26
85 -	50	20
9 0 -	24	10
95 -	3	1
100 - 105	2	0
	141	70
Range:	47.5 - 101.0	62.6 - 95.8
Mean:	84.5	84.0
S.D.:	7.52	6.46

SOCIAL SCORES

Main sample - 4 week examination - Social score

Score	No. of children
5.0 - 5.5	1
...	
7.0 -	1
7.5 -	0
8.0 -	9
8.5 -	15
9.0 -	30
9.5 -	41
10.0 -	50
10.5 - 11.0	21
	168

Range: 5.1 - 10.9
Mean: 9.7
S.D.: 0.69

Main Sample - 16 week examination - Social score

Score	No. of children
52 -	1
54 -	0
56 -	2
58 -	13
60 -	27
62 -	56
64 -	47
66 - 68	1
	147

Range: 52.2 - 66.1
Mean: 62.7
S.D.: 2.05

Main sample - 28 week examination -Social score

Score	No. of children
52 -	3
54 -	14
56 -	35
58 -	50
60 -	31
62 -	14
64 -	4
66 -	2
68 - 70	1
	154

Range:	52.4 - 69.1
Mean:	59.1
S.D.:	2.75

40 week examination - Social score

Main Sample		Preliminary Sample	
Score	No. of children	Score	No. of children
50 -	1	42 -	1
52 -	6	45 -	2
54 -	12	48 -	20
56 -	16	51 -	32
58 -	32	54 -	29
60 -	42	57 -	10
62 -	21	60 -	1
64 -	11	63 - 66	2
66 -	8		97
68 -	0		
70 - 72	4		
	153		
Range:	50.1 - 71.1	Range:	42.2 - 64.3
Mean:	60.5	Mean:	53.5
S.D.:	3.72	S.D.:	3.58

52 week examination - Social score

Score	Main Sample No. of children	Preliminary Sample No. of children
45 -	1	0
48 -	2	1
51 -	10	2
54 -	9	4
57 -	24	19
60 -	47	25
63 -	25	17
66 -	20	5
69 - 72	5	0
	143	73
Range:	46.3 - 71.6	50.3 - 68.9
Mean:	61.5	61.1
S.D.:	4.74	3.50

APPENDIX 6

DISTRIBUTION OF THE DEVELOPMENTAL SCORES

BY THE SOCIAL AND OBSTETRIC FACTORS STUDIED.

SOCIAL FACTORS

Distribution of the samples by social class.

	Social class of father I,II & IIIa	IIIb	IV	V & Unemployed	Total
Main sample					
4 weeks	47	57	25	39	168
16 weeks	42	49	22	34	147
28 weeks	46	56	22	30	154
40 weeks	45	53	21	34	153
52 weeks	43	51	20	29	143
Preliminary sample					
40 weeks	16	31	23	27	97
52 weeks	11	23	19	19	72

	Social class of mother I & II	III	IV & V	Total
Main sample				
4 weeks	23	48	97	168
16 weeks	20	44	83	147
28 weeks	22	46	86	154
40 weeks	21	45	87	153
52 weeks	20	44	79	143
Preliminary sample				
40 weeks	2	34	61	97
52 weeks	1	25	46	72

Combined social class

	SCF I,II & IIIa		SCF IIIb		SCF IV,V & U		Total
	SCM I,II & IIIa	SCM IIIb IV & V	SCM I, II&III	SCM IV&V	SCM I, II &III	SCM IV&V	
Main Sample							
4 weeks	32	15	25	32	10	54	168
16 weeks	28	14	22	27	10	46	147
28 weeks	31	15	25	31	8	44	154
40 weeks	30	15	23	30	9	46	153
52 weeks	30	13	23	28	8	41	143
Preliminary sample							
40 weeks	8	8	14	17	11	39	97
52 weeks	6	5	8	15	10	28	72

Distribution of the samples by family size.

	Family size				
	1	2	3	>3	Total
Main sample					
4 weeks	62	48	29	29	168
16 weeks	55	41	27	24	147
28 weeks	60	44	23	27	154
40 weeks	56	46	24	27	153
52 weeks	55	43	22	23	143
Preliminary sample					
40 weeks	34	22	14	27	97
52 weeks	21	21	9	21	72

Distribution of the samples by the number of children in the family, aged less than 5 years.

	No. children in family aged less than 5 yr.			
	1	2	> 2	Total
Main Sample				
4 weeks	76	61	31	168
16 weeks	67	53	27	147
28 weeks	72	56	26	154
40 weeks	68	57	28	153
52 weeks	66	53	24	147
Preliminary Sample				
40 weeks	50	32	15	97
52 weeks	36	25	11	72

Distribution of the samples by maternal age

	Maternal Age			
	Less than 25 yr.	25 -	30 yr. or older	Total
Main sample				
4 weeks	70	49	49	168
16 weeks	62	43	42	147
28 weeks	64	47	43	154
40 weeks	61	48	44	153
52 weeks	57	46	40	143
Preliminary sample				
40 weeks	41	24	29	95
52 weeks	28	17	25	70

Distribution of the samples by height of mother.

	Maternal height					
	<60"	60"-	62"-	64"+	N.K.	Total
Main Sample						
4 weeks	22	46	60	24	16	168
16 weeks	18	42	55	18	14	147
28 weeks	20	42	59	22	11	154
40 weeks	20	39	58	22	14	153
52 weeks	17	39	53	21	13	143

Preliminary Sample - Height not recorded in 33% of the records consulted.

Distribution of the mean values of the developmental scores by maternal age, and maternal height.

PHYSICAL SCORE

	Main sample				Prelim. sample
	4 weeks	16 weeks	28 weeks	40 weeks	40 weeks
Sample Mean	63.4	54.0	49.2	69.8	68.6
Maternal age					
< 25 yr.	63.3	53.7	49.5	70.7	69.0
25 yr. -	63.9	54.5	49.3	69.4	68.6
30 yr. +	63.0	53.7	48.7	69.2	68.1
Maternal height					
< 60"	62.4	56.3	49.0	69.6	-
60" -	62.4	52.8	48.9	68.7	-
62" -	64.6	54.2	49.5	70.6	-
64" +	63.4	54.1	49.4	69.4	-
N.K.	63.1	53.4	48.9	71.0	-

SIT WALK SCORE

	Main sample			Prelim. sample	
	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	41.3	43.8	44.2	43.6	43.8
Maternal age					
< 25 yr.	41.4	44.2	45.8*	44.8	45.6
25 yr. -	41.6	43.7	43.8	42.1	41.7
30 yr. +	40.8	43.4	42.3*	43.0	42.9
Maternal height					
< 60"	40.4	42.9	41.9	-	-
60"-	41.3	43.5	43.0	-	-
62" -	41.7	44.3	45.2	-	-
64" +	41.4	43.1	44.4	-	-
N.K.	40.7	45.2	46.3	-	-

HAND EYE SCORE

	4 weeks	16 weeks
Sample Mean	31.7	28.7
Maternal age		
< 25 yr.	31.6	28.5
25 yr. -	32.0	28.8
30 yr. +	31.6	28.9
Maternal height		
< 60"	31.3	28.9
60" -	31.5	28.4
62" -	32.0	28.7
64"+	32.3	29.3
N.K.	31.2	28.4

TABLE TOP SCORE

	Main Sample				Prelim. sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	16.6	84.6	83.3	84.5	83.0	84.0
Maternal age						
< 25 yr.	16.5	84.1	83.3	85.2*	82.9	85.0
25 yr. -	16.9	85.7	84.8	86.2	83.7	83.0
30 yr. +	16.3	84.0	81.6	81.5*	83.3	83.5
Maternal height						
< 60"	16.7	84.6	80.5*	81.3*	-	-
60" -	16.2	84.6	82.9	83.0	-	-
62" -	16.6	84.2	84.5	84.9	-	-
64" +	17.4	86.4	86.6*	88.5*	-	-
N.K.	16.3	82.9	77.9	84.8	-	-

SOCIAL SCORE

	Main Sample				Prelim. sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	62.7*	59.1*	60.5*	61.5*	53.5	61.1
Maternal age						
< 25 yr.	62.6	59.2	60.2	62.0	53.5	61.9
25 yr. -	62.9	59.4	61.4	62.0	53.8	61.2
30 yr. +	62.5	58.6	59.8	60.3	53.1	59.7
Maternal height						
< 60"	63.2	58.9	60.0	61.0	-	-
60" -	62.4	59.1	61.0	61.5	-	-

SOCIAL SCORE ... Cont.

	Main sample				Prelim. Sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	62.7*	59.1*	60.5*	61.5*	53.5	61.1
Maternal height						
62" -	62.8	59.4	60.6	62.2	-	-
64" +	62.8	59.2	61.6	63.3	-	-
N.K.	62.0	57.8*	57.4*	56.6*	-	-

Note: In these distribution tables, the values which differ from each other to a statistically significant degree ($p < .05$) are marked with an asterisk.

THE EXAMINER'S ASSESSMENT OF THE CHILD AND HIS FAMILY.

These assessments were available for the main sample only.

Distribution of the sample by "Attitude of child"

	Attitude of child					
	9(V.Good)	8	7	6	<6(poor)	Total
4 weeks	23	36	26	34	49	168
16 weeks	19	33	22	30	43	147
28 weeks	22	34	26	34	38	154
40 weeks	22	32	25	33	41	153
52 weeks	20	32	25	29	37	143

Distribution of the sample by attitude of the father and of siblings to the study child.

	Att. of father			Att. of siblings				
	Good	Av.	Total	Good	Av.	Jealous	N.A.	Total
4 weeks	71	97	168	47	47	13	62	168
16 weeks	64	83	147	42	41	10	55	147
28 weeks	69	85	154	47	36	12	60	154
40 weeks	65	88	153	47	39	12	56	153
52 weeks	66	77	143	46	31	12	55	143

Distribution of the sample by the "Family Description"

	Family description				
	Stimulating	Good	Fair	Poor	Total
4 weeks	38	82	38	10	168
16 weeks	31	77	30	9	147
28 weeks	37	79	31	7	154
40 weeks	36	78	30	9	153
52 weeks	36	74	25	8	143

Distribution of the sample by "Mother's time"

	Mother's time				
	10(optimum)	9	8	< 8	Total
4 weeks	63	16	69	20	168
16 weeks	56	15	59	17	147
28 weeks	61	15	65	13	154
40 weeks	59	16	62	16	153
52 weeks	59	15	59	10	147

Distribution of the mean values of the developmental scores by the examiner's assessments of the child and his family.

PHYSICAL SCORE

	4 weeks	16 weeks	28 weeks	40 weeks
Sample mean	63.4	54.0	49.2	69.8
Attitude of child				
9 (good)	65.1 }*	56.3*	51.9*	72.0*
8	62.4	54.3	50.2	70.8
7	64.0	55.5	50.0	70.6
6	64.0	54.8	49.3	70.6
< 6 (Poor)	62.5*	51.4*	45.0*	67.0*
Attitude of father				
Good	63.6	54.5	50.1	70.5
Average	63.2	53.6	48.5	69.4
Attitude of siblings				
Good	63.5	53.8*	49.4*	69.9
Average	62.4	52.9	47.3	68.1
Jealous	63.9	48.9*	44.8*	69.3
N.A.	63.9	55.7	51.0	71.2
Family description				
Stimulating	64.2*	54.4*	50.6*	69.9
Good	63.5	55.1	49.9	70.5
Fair	63.0	52.5	47.3	69.9
Poor	60.2*	47.4*	42.7*	63,9
Mother's time				
10 (optimum)	63.9 }*	54.6*	50.5*	70.7*
9	64.9	53.8	49.4	70.4
8	63.2	54.7	48.8	69.9
<8	61.2*	49.6*	44.9*	66.1*

SIT WALK SCORE

	28 weeks	40 weeks	52 weeks
Sample mean	41.3	43.8	44.2
Attitude of child			
9 (Good)	43.6*	47.8*	48.2*
8	42.1	44.8	46.4
7	42.4	44.0	44.5
6	41.0	45.6	46.1
< 6 (poor)	38.8*	39.4*	38.3*
Attitude of father			
Good	42.1	43.9	44.6
Average	40.7	43.8	43.8
Attitude of siblings			
Good	41.7*	44.4	44.8
Average	40.1	42.1	41.4
Jealous	39.5*	43.0	42.5
N.A.	42.1	44.6	45.5
Family description			
Stimulating	42.2*	43.3	44.3
Good	41.6	44.7	45.1
Fair	40.3	43.3	43.0
Poor	38.3*	39.9	38.6
Mother's time			
10 (optimum)	42.3*	44.8	45.5*
9	41.2	43.8	43.7
8	41.0	43.8	43.9
< 8	38.9*	40.7	38.8*

HAND EYE SCORE

	4 weeks	16 weeks
Sample mean	31.7	28.7
Attitude of child		
9 (good)	32.4	29.3
8	31.5	28.8
7	32.4	29.4
6	31.8	28.8
<6 (Poor)	31.1	28.1
Attitude of father		
Good	31.9	29.0
Average	31.6	28.4
Attitude of siblings		
Good	32.0	29.0
Average	31.1	28.2
Poor	30.8	27.3
N.A.	32.2	29.0
Family description		
Stimulating	32.3*	29.0
Good	32.0	29.1
Fair	31.2	28.1
Poor	29.6*	26.2
Mother's time		
10 (optimum)	32.4*	29.0
9	31.2	28.9
8	31.7	28.7
<8	30.1*	27.4

TABLE TOP SCORE

	16 weeks	28 weeks	40 weeks	52 weeks
Sample mean	16.6	84.6	83.3	84.5
Attitude of child				
9 (Good)	17.2*	88.3*	90.0*	91.8*
8	17.1	86.2	87.7	88.0
7	17.0	85.5	86.7	86.1
6	16.3	84.2	83.5	83.2
<6 (Poor)	15.8*	80.6*	73.7*	77.1*
Attitude of father				
Good	17.2*	86.3*	87.2*	86.9*
Average	16.0*	83.2*	80.4*	82.3*
Attitude of siblings				
Good	16.4	84.5*	83.5*	84.6*
Average	16.0	82.3	78.5	80.2*
Jealous	16.5	78.6*	73.5*	81.5
N.A.	17.1	87.2	88.5	87.7
Family description				
Stimulating	17.0*	87.6*	88.9*	88.8*
Good	16.8	85.4	85.4	85.1
Fair	16.0	80.8*	75.3*	79.0*
Poor	14.6*	76.5*	69.1*	74.7*
Mother's time				
10 (optimum)	17.0 } *	86.8*	88.6*	88.4*
9	17.5 } *	85.1	87.9	86.0
8	16.2	83.1	80.2*	82.0
<8	15.5*	80.9*	70.9*	72.3*

SOCIAL SCORE

	16 weeks	28 weeks	40 weeks	52 weeks
Sample mean	62.7	59.1	60.5	61.5
Attitude of child				
9 (Good)	63.3*	60.1*	62.9*	64.9*
8	63.2	59.6	61.7	63.8
7	62.9	59.2	60.8	61.7
6	62.7	59.3	60.3	61.3
< 6	61.8*	57.8*	58.2*	57.7*
Attitude of father				
Good	63.1	59.8	61.7*	63.3*
Average	62.3	58.5	59.6*	60.0*
Attitude of siblings				
Good	62.6	58.6	60.5	61.5*
Average	62.0	58.1	58.8	59.5
Jealous	61.5	57.2	57.2*	57.3*
N.A.	63.4	60.5	62.4	63.6"
Family description				
Stimulating	63.1*	59.9*	62.7*	64.3*
Good	63.0	59.5*	60.8	61.9*
Fair	62.0	57.8	58.0*	58.7*
Poor	60.4*	56.7*	56.6*	53.8*
Mother's time				
10 (optimum)	63.2 }*	59.6	62.4*	63.5*
9	63.6 }	60.4	61.1	62.7
8	62.4	58.4	59.2	60.4
< 8	61.1*	58.3	57.7*	54.5*

OBSTETRIC FACTORS

Distribution of the samples by the incidence of complications of pregnancy.

	Number of complications of pregnancy							
	Total sample				Children with no sibs<5			
	None	1	>1	Total	None	1	>1	Total
Main sample								
4 weeks	116	39	13	168	46	22	8	76
16 weeks	100	34	13	147	40	19	8	67
28 weeks	104	37	13	154	43	21	8	72
40 weeks	103	37	13	153	40	20	8	68
52 weeks	96	34	13	143	40	18	8	66
Preliminary sample								
	None	1	>1	Total	None	Any		Total
40 weeks	73	19	5	97	32	18		50
52 weeks	53	14	5	72	22	14		36

Distribution of the samples by the incidence of complications of labour and delivery.

	Number of complications of labour and delivery							
	Total sample				Children with no sibs<5			
	None	1 or 2	>2	Total	None	1 or 2	>2	Total
Main sample								
4 weeks	57	68	43	168	12	30	34	76
16 weeks	51	59	37	147	10	28	29	67
28 weeks	52	64	38	154	12	28	32	72
40 weeks	56	61	36	153	12	27	29	68
52 weeks	51	56	36	143	12	24	30	66
Preliminary sample								
40 weeks	47	23	27	97	15	11	24	50
52 weeks	37	18	17	72	12	9	15	36

Distribution of the samples by the incidence of complications during the first ten days of the child's life.

	Complications in the first 10 days					
	Total sample			Children with no sibs < 5		
	None	Any	Total	None	Any	Total
Main sample						
4 weeks	145	23	168	61	15	76
16 weeks	127	20	147	54	13	67
28 weeks	135	19	154	59	13	72
40 weeks	134	19	153	55	13	68
52 weeks	126	17	143	54	12	66
Preliminary sample						
40 weeks	79	18	97	-	-	-
52 weeks	57	15	72	-	-	-

Distribution of the samples by the occurence of toxaemia during pregnancy.

	Total sample			Children with no sibs < 5		
	No Tox.	Toxaemia	Total	No Tox.	Toxaemia	Total
Main sample						
4 weeks	149	17	166	62	14	76
16 weeks	129	16	145	54	13	67
28 weeks	136	16	152	59	13	72
40 weeks	137	16	153	55	13	68
52 weeks	127	16	143	49	17	66
Preliminary sample						
40 weeks	79	16	95	37	13	50
52 weeks	57	13	70	26	10	36

Distribution of the samples by mode of onset of labour.

	Mode of onset of labour							
	Total sample				Children with no sibs <5			
	Spont.	Induced	None	Total	Spont.	Induced	None	Total
Main sample								
4 weeks	88	64	14	166	31	39	6	76
16 weeks	78	56	11	145	27	34	6	67
28 weeks	82	59	11	152	29	37	6	72
40 weeks	85	55	11	151	28	34	6	68
52 weeks	77	54	10	141	27	34	5	66
Preliminary sample								
40 weeks	68	22	5	95	-	-	-	-
52 weeks	48	18	4	70	-	-	-	-

Distribution of the samples by complications arising in the child during labour

	Total sample				Children with no sibs <5			
	Complications		No		Complications		No	
	None	Any	labour	Total	None	Any	labour	Total
Main sample								
4 weeks	127	25	14	166	51	19	6	76
16 weeks	113	21	11	145	44	17	6	67
28 weeks	118	23	11	152	48	18	6	72
40 weeks	120	20	11	151	47	15	6	68
52 weeks	111	20	10	141	45	16	5	66
Preliminary sample								
40 weeks	75	15	5	95	35	13	2	50
52 weeks	48	18	4	70	27	7	2	36

Distribution of the samples by complications arising in the mother during labour.

	Total sample				Children with no sibs < 5			
	Complications		No		Complications		No	
	None	Any	labour	Total	None	Any	labour	Total
Main sample								
4 weeks	124	28	14	166	45	25	6	76
16 weeks	110	24	11	145	39	22	6	67
28 weeks	115	26	11	152	42	24	6	72
40 weeks	115	25	11	151	39	23	6	68
52 weeks	106	25	10	141	38	23	5	66
Preliminary sample								
40 weeks	75	15	5	95	33	15	2	50
52 weeks	57	9	4	70	25	9	2	36

Distribution of the samples by the occurence of prolonged labour.

	Duration of secondstage of labour							
	Total sample				Children with no sibs < 5			
	< 2hr.	> 2hr.	N.A./N.K.	Total	< 2hr.	> 2hr.	N.A./N.K.	Total
Main sample								
4 weeks	139	11	18	168	56	9	11	76
16 weeks	122	9	16	147	51	7	9	67
28 weeks	128	10	16	154	55	8	9	72
40 weeks	128	10	15	153	52	8	8	68
52 weeks	120	9	14	143	52	7	7	66
Preliminary sample								
40 weeks	76	5	16	97	-	-	-	-
52 weeks	55	4	13	72	-	-	-	-

Distribution of the samples by the type of delivery.

Type of delivery

	Total sample				Children with no sibs<5			
	S.V.D.	C.S.	Other	Total	S.V.D.	C.S.	Other	Total
Main sample								
4 weeks	115	20	31	168	38	12	26	76
16 weeks	103	17	25	145	34	12	21	67
28 weeks	105	17	30	152	36	10	26	72
40 weeks	107	16	28	151	35	9	24	68
52 weeks	98	15	28	141	33	8	25	66
Preliminary sample								
40 weeks	75	8	12	95	33	7	10	50
52 weeks	58	6	6	70	26	5	5	36

Key: S.V.D. - Spontaneous vertex delivery.
C.S. - lower uterine segment Caesarean section.
Other - all other operative or assisted deliveries.

Distribution of the samples by maternal analgesia and anaesthesia during labour.

Analgesia or anaesthesia administered

	Total sample				Children with no sibs < 5			
	None /inhal.	Analg+ L.A./Sp.	G.A.	Total	None /inhal.	Analg+ L.A./Sp.	G.A.	Total
Main sample								
4 weeks	17	121	28	168	2	53	21	74
16 weeks	15	107	23	145	2	46	19	67
28 weeks	17	109	26	152	2	51	19	72
40 weeks	17	110	24	151	2	49	17	68
52 weeks	15	103	23	141	2	48	16	66
Preliminary sample								
40 weeks	14	71	10	95	-	40	10	50
52 weeks	11	52	7	70	-	31	5	36

Key: None/inhal. - Administration of any anaesthetic or analgesic not recorded or only self administration of inhalation analgesia recorded.

Analg + L.A./Sp. - Use of both analgesics and either local or spinal anaesthesia recorded.

G.A. - general anaesthetic administered.

Distribution of the sample by the Apgar score allotted at birth - for all children of main sample only.

Apgar count at:

	One minute			Two minutes			Total
	9-10	7-8	< 7	9-10	7-8	<7	
4 weeks	54	44	18	26	12	12	166
16 weeks	47	38	15	23	11	11	145
28 weeks	51	41	14	24	12	11	152
40 weeks	51	42	12	23	12	11	151
52 weeks	47	39	12	21	12	10	141

Distribution of the samples by the care required during the first forty eight hours of life.

Type of care required

	Routine care only	$>O_2$, with mother	Cot nursed	$>O_2$ and cot nursed	Total
Main sample					
4 weeks	130	7	12	17	166
16 weeks	114	6	10	15	145
28 weeks	120	7	11	14	152
40 weeks	122	6	10	13	151
52 weeks	113	7	9	12	141
Preliminary sample					
40 weeks	78	7	3	8	95
52 weeks	60	3	2	5	70

Distribution of the mean values of the developmental scores by the obstetric factors studied.

PHYSICAL SCORE.

	Main sample				Prelim.sample
	4 weeks	16 weeks	28 weeks	40 weeks	40 weeks
Sample mean	63.4	54.0	49.2	69.8	68.6
<u>Toxaemia</u>					
Total sample					
No toxaemia	63.3	54.0	49.0	69.6*	68.5
Toxaemia	64.2	54.5	50.9	71.5*	69.3
Children with no sibs < 5					
No toxaemia	63.7	55.8	50.9	70.6	68.8
Toxaemia	64.2	54.7	50.6	71.9	69.7

Physical score ... cont.

	Main sample 4 weeks	16 weeks	28 weeks	40 weeks	Prelim.sample 40 weeks
sample mean	63.4	54.0	49.2	69.8	68.6
<u>Onset of labour</u>					
Total sample					
Spontaneous	63.3	53.9	48.6	69.3	68.6
Induced	63.7	54.0	49.8	70.4	68.6
No labour	62.9	55.5	51.2	70.6	68.6
Children with no sibs < 5					
Spontaneous	63.6	56.0	50.9	71.1	-
Induced	64.1	55.3	50.6	70.8	-
No labour		Not calculated.			
<u>Complications in child</u>					
Total sample					
No complic.	63.5	54.1	48.7	69.8	68.5
Any complic.	62.8	53.3	51.5	69.8	69.3
Children with no sibs < 5					
No complic.	64.0	56.4*	50.7	71.1	68.7
Any complic.	63.2	53.8*	51.8	70.7	69.7
<u>Complications in mother</u>					
Total sample					
No complic.	63.1	53.6*	48.7*	69.5	68.5
Any complic.	64.9	55.6*	51.2*	71.1	69.2
Children with no sibs < 5					
No complic.	63.0	55.5	51.0	71.0	69.0
Any complic.	65.2	55.3	51.0	70.9	69.2
<u>Duration of second stage of labour</u>					
Total sample					
< 2 hours	63.3	53.5*	48.7*	69.5	68.6
> 2 hours	63.5	57.3*	52.1*	71.5	69.2
Children with no sibs < 5					
< 2 hours	63.8	55.0	50.6	70.8	-
> 2 hours	63.5	58.1	51.8	71.3	-

Physical score - contd.

	Main sample 4 weeks	16 weeks	28 weeks	40 weeks	Prelim.sample 40 weeks
<u>Type of delivery</u>					
Total sample					
S.V.D.	63.3	53.7	48.6*	69.6	68.5
L.U.S.C.S.	63.5	55.1	51.2*	71.1	68.1
Other	63.8	54.7	50.4	70.0	69.6
Children with no sibs < 5					
S.V.D.	63.4	55.8	50.9	70.9	68.8
L.U.S.C.S.	64.1	54.8	51.4	70.9	68.6
Other	64.3	55.6	50.4	70.7	70.2
<u>Labour analgesia and anaesthesia</u>					
Total sample					
None/inhal.	63.6	55.6	47.6	68.5	68.5
Analgesia + L.A./Spinal	63.2	53.7	49.2	69.7	68.8
General anaesthesia	64.1	54.7	50.4	71.3	68.6
Children with no sibs < 5					
None/inhal.		not calculated			
Analgesia + L.A./Spinal	63.4	56.2	51.0	70.7	68.8
General anaesthesia	64.8	54.1	50.3	71.3	70.2
<u>Apgar count</u>					
Total sample					
1 min. 9-10	62.9	53.4	47.8	68.7	-
1 min. 7-8	63.3	53.9	50.6	70.4	-
1 min. < 7	62.2	53.7	50.4	69.8	-
2 min. 9-10	64.2	55.1	49.0	69.8	-
2 min. 7-8	65.1	54.5	48.3	70.3	-
2 min. < 7	64.5	55.0	51.0	71.5	-

Physical score - cont.

Care in first 48 hours of life

	Main sample				Prelim.sample
	4 weeks	16 weeks	28 weeks	40 weeks	40 weeks
Total sample					
Routine care	63.3	54.3	49.1	69.7	68.5
$> O_2$, nursed with mother.	63.5	54.4	50.2	71.9	69.1
Cot nursed.	65.0	54.7	48.8	69.1	68.4
$> O_2$ and cot nursed.	63.1	52.1	49.7	70.7	68.6

SIT WALK SCORE

	Main sample			Prelim. sample	
	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample mean	41.3	43.8	44.2	43.6	43.8
Toxaemia					
Total sample					
No toxaemia	41.2	43.6	43.9	43.5	43.2
Toxaemia	42.1	45.3	46.5	44.1	45.8
Children with no sibs < 5					
No toxaemia	42.2	44.1	44.8	44.3	45.4
Toxaemia	41.9	45.3	45.8	45.1	47.2
Onset of labour					
Total sample					
Spontaneous	40.9	43.1	43.1	43.6	43.8
Induced	41.7	44.6	45.4	43.4	43.8
No labour	42.3	45.5	46.2	43.7	43.8
Children with no sibs < 5					
Spontaneous	42.4	44.6	44.7	-	-
Induced	41.8	44.3	45.4	-	-
No labour		Not calculated		-	-
Complications in child					
Total sample					
No complic.	41.1	43.7	43.8	43.8	43.7
Any complic.	42.8	44.4	46.8	43.0	43.8
Children with no sibs <5					
No complic	42.2	45.1	45.3	44.8	46.2
Any complic.	42.6	43.6	45.8	43.0	44.3

Sit Walk score - cont.

	Main sample 28 weeks	40 weeks	52 weeks	Prelim. sample 40 weeks	52 weeks
<u>Complications in mother</u>					
Total sample					
No complic.	41.3	43.8	44.1	43.6	43.5
Any complic.	41.9	43.9	45.3	44.2	44.9
Children with no sibs < 5					
No complic.	42.7	45.5	45.7	44.7	46.2
Any complic.	41.9	43.4	45.0	44.2	44.9
<u>Duration of second stage of labour</u>					
Total sample					
< 2 hours	41.1	43.5	44.0	43.7	43.7
> 2 hours	43.1	45.8	46.1	43.6	45.8
Children with no sibs < 5					
< 2 hours	42.0	44.4	45.2	-	-
> 2 hours	43.0	45.3	45.8	-	-
<u>Type of delivery</u>					
Total sample					
S.V.D.	41.2	43.6	43.6	43.9	43.5
L.U.S.C.S.	41.8	45.2	45.9	42.6	41.4
Other	41.6	43.6	45.4	42.5	48.0
Children with no sibs < 5					
S.V.D.	42.7	45.2	43.4	44.9	45.9
L.U.S.C.S.	41.6	43.4	44.7	43.9	42.3
Other	41.5	43.3	44.7	43.6	49.6
<u>Labour analgesia and anaesthesia</u>					
Total sample					
None/inhal.	39.7	40.7	41.7	44.0	43.6
Analgesia + L.A./Spinal	41.5	44.0	44.4	44.2	45.3
General anaesthesia	41.6	45.0	45.0	43.2	49.6
Children with no sibs < 5					
None/inhal.		Not calculated			
Analgesia + L.A./Spinal	42.4	44.6	45.6	44.7	45.3
General anaesthesia	41.4	43.9	43.9	43.6	49.6

Sit Walk - contd.

	Main sample 28 weeks	40 weeks	52 weeks	Prelim. sample 40 weeks	52 weeks
<u>Apgar count</u>					
Total sample					
1 min. 9-10	40.7	41.8	42.1	-	-
1 min. 7-8	42.4	45.3	45.7	-	-
1 min. < 7	40.5	45.0	46.5	-	-
2 min. 9-10	41.6	44.4	44.8	-	-
2 min. 7-8	40.5	43.1	44.0	-	-
2 min. <7	41.9	45.2	44.6	-	-
<u>Care in first 48 hours of life</u>					
Total sample					
Routine care.	41.5	43.6	44.1	43.6	43.8
$>O_2$, nursed with mother.	42.1	48.2	50.3	43.7	43.8
Cot nursed.	39.8	41.9	42.1	43.7	-
$>O_2$ and cot nursed.	40.9	44.3	43.2	43.6	43.8

HAND EYE SCORE

	4 weeks	16 weeks
Sample mean	31.7	28.7
<u>Toxaemia</u>		
Total sample		
No toxaemia	31.8	28.7
Toxaemia	31.5	29.3
Children with no sibs < 5		
No toxaemia	32.4	29.1
Toxaemia	31.7	29.1
<u>Onset of labour</u>		
Total sample		
Spontaneous	31.9	28.6
Induced	31.5	28.7
No labour	31.9	29.8
Children with no sibs < 5		
Spontaneous	32.6	29.0
Induced	31.9	29.0
No labour	Not calculated	

Hand Eye score - cont.

	4 weeks	16 weeks
<u>Complications in child</u>		
Total sample		
No complic.	31.7	28.5
Any complic.	31.9	29.2
Children with no sibs <5		
No complic.	32.3	29.0
Any complic.	32.1	29.2
<u>Complications in mother</u>		
Total sample		
No complic.	31.6	28.6
Any complic.	32.6	28.8
Children with no sibs <5		
No complic.	32.0	29.1
Any complic.	32.8	28.9
<u>Duration of second stage of labour</u>		
Total sample		
<2 hours	31.6	28.5
>2 hours	32.6	29.8
Children with no sibs <5		
<2 hours	32.0	28.9
>2 hours	32.8	29.1
<u>Type of delivery</u>		
Total sample		
S.V.D.	31.6	28.6
L.U.S.C.S.	32.0	29.8
Other	32.0	28.7
Children with no sibs <5		
S.V.D.	32.2	29.0
L.U.S.C.S.	32.2	30.0
Other	32.3	28.8

Hand Eye score - cont.

	4 weeks	16 weeks
<u>Labour analgesia and anaesthesia</u>		
Total sample		
None/inhal.	31.7	29.1
Analgesia + L.A. or Spinal	31.8	28.5
General anaesthesia	31.7	29.5
Children with no sibs < 5		
None/inhal.	Not calculated	
Analgesia + L.A. or Spinal	32.4	29.0
General anaesthesia	31.8	29.5
<u>Apgar count</u>		
Total sample		
1 min. 9-10	31.7	28.5
1 min. 7-8	31.7	28.8
1 min. < 7	31.3	28.1
2 min. 9-10	32.7	28.8
2 min. 7-8	31.2	29.0
2 min. < 7	31.5	30.0
<u>Care in first 48 hours of life</u>		
Total sample		
Routine care.	31.8	28.7
> O_2, nursed with mother	31.2	28.7
Cot nursed	32.0	28.3
> O_2 and cot nursed	31.1	28.6

TABLE TOP SCORE

	Main sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim. sample 40 weeks	52 weeks
Sample mean	16.6	84.6	83.3	84.5	83.0	84.0
<u>Toxaemia</u>						
Total sample						
No toxaemia	16.5	84.4	83.1	83.8*	83.1	84.0
Toxaemia	17.1	86.3	85.9	90.4*	83.5	83.7
Children with no sibs < 5						
No toxaemia	17.0	87.4	87.8	85.7	86.2	86.3
Toxaemia	17.3	86.6	85.2	90.0	83.2	85.8
<u>Onset of labour</u>						
Total sample						
Spontaneous	16.6	83.7	82.1	82.7	83.3	83.9
Induced	16.5	85.8	85.3	86.6	82.5	84.0
No labour	16.5	84.5	83.9	86.1	84.8	83.9
Children with no sibs < 5						
Spontaneous	17.3	86.8	87.7	84.8	-	-
Induced	16.9	87.7	87.6	87.7	-	-
No labour		Not calculated			-	-
<u>Complications in child</u>						
Total sample						
No complic.	16.5	84.1	83.1	83.9*	82.7	83.7
Any complic.	17.0	86.9	86.1	88.4*	85.4	86.0
Children with no sibs < 5						
No complic.	17.1	87.2	88.0	80.3	85.7	85.7
Any complic.	17.0	87.7	87.7	88.8	85.4	86.0
<u>Complications in mother</u>						
Total sample						
No complic.	16.5	83.9*	82.5*	84.2	82.8	83.6
Any complic.	17.1	87.3*	88.3*	86.3	84.6	86.1
Children with no sibs <5						
No complic.	17.1	87.2	87.8	87.5	85.6	85.7
Any complic.	17.1	87.5	88.2	86.2	84.6	86.1

Table Top score - cont.

	Main sample				Prelim. sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
<u>Type of delivery</u>						
Total sample						
S.V.D.	16.5	83.8*	82.4*	83.7	83.0	83.8
L.U.S.C.S.	16.6	86.0	84.7	86.2	84.8	84.8
Other	16.9	86.5*	86.4*	86.4	83.5	85.0
Children with no sibs < 5						
S.V.D.	17.1	87.2	88.0	86.6	86.6	86.0
L.U.S.C.S.	16.8	87.8	84.8	87.1	85.0	87.7
Other	17.1	87.1	87.2	86.2	81.8	85.4
<u>Labour analgesia and anaesthesia</u>						
Total sample						
None/inhal.	16.2	84.1	82.8	84.3	82.8	83.9
Analgesia + L.A./Spinal.	16.6	84,5	83.1	87.0	84.2	84.8
General anaesthesia	16.7	85.3	85.3	86.0	83.7	83.2
Children with no sibs < 5						
None/inhal.		Not calculated			-	-
Analgesia + L.A./Spinal.	17.1	87.8	87.7	86.5	-	-
General anaesthesia.	16.8	86.0	85.5	86.3	-	-
<u>Apgar count</u>						
Total sample						
1 min. 9-10	16.5	82.9	80.9	82.7	-	-
1 min. 7-8	16.7	84.7	83.6	84.3	-	-
1 min. < 7	16.0	85.0	82.5	83.3	-	-
2 min. 9-10	16.6	86.5	84.8	86.5	-	-
2 min. 7-8	16.1	86.1	87.5	87.4	-	-
2 min. < 7	17.5	85.2	87.8	87.0	-	-
<u>Care in first 48 hours of life</u>						
Total sample						
Routine care.	16.6	84.4	82.9	84.0	82.7	83.7
> O_2, nursed with mother.	16.2	84.9	85.8	92.1	85.5	83.9
Cot nursed.	16.7	85.8	89.2	84.8	85.7	-
> O_2 and cot nursed.	16.4	85.3	82.8	84.8	85.9	85.1

SOCIAL SCORE

	Main sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim. sample 40 weeks	52 weeks
Sample mean	62.7	59.1	60.5	61.5	53.5	61.1
<u>Toxaemia</u>						
Total sample						
No toxaemia	62.6	59.1	60.4	61.5	53.4	61.1
Toxaemia	63.1	59.5	61.8	62.6	53.9	61.4
Children with no sibs < 5						
No toxaemia	63.5	60.4	62.0	63.3	54.5	63.0*
Toxaemia	63.0	59.7	62.0	61.8	53.3	61.2*
<u>Onset of labour</u>						
Total sample						
Spontaneous	62.4	58.8	60.0	60.8	52.8*	60.9
Induced	62.9	59.8	61.5	62.9	55.5*	61.5
No labour	63.2	57.8	60.2	61.2	54.1	62.5
Children with no sibs < 5						
Spontaneous	63.0	59.9	61.5	62.2	-	-
Induced	63.7	60.8	62.6	63.8	-	-
No labour		Not calculated			-	-
<u>Complications in child</u>						
Total sample						
No complic.	62.6	58.9*	60.3*	61.4*	53.1*	60.9*
Any complic.	62.9	60.5*	62.3*	63.4*	55.7*	63.6*
Children with no sibs < 5						
No complic.	63.6	60.2	62.0	63.1	54.4*	62.2
Any complic.	6311	60.7	62.6	63.5	56.0*	63.7
<u>Complications in mother</u>						
Total sample						
No complic.	62.5*	58.7*	60.2*	61.3	53.6	60.9
Any complic.	63.4*	60.8*	62.3*	63.3	53.1	62.9
Children with no sibs < 5						
No complic.	63.4	59.9	62.1	63.3	54.6	62.3
Any complic.	63.5	60.9	62.2	63.0	53.1	62.9

Social score - cont.

	Main sample 16 weeks	28 weeks	40 weeks	52 weeks	Prelim.sample 40 weeks	52 weeks
<u>Duration of second stage of labour</u>						
Total sample						
< 2 hours	62.4*	58.7*	60.1	61.1*	53.4	61.0
> 2 hours	63.8*	61.0*	63.3	65.2*	53.0	63.1
Children with no sibs < 5						
< 2 hours	63.1	59.8	61.6	62.5	-	-
> 2 hours	64.1	61.3	63.3	65.1	-	-
<u>Type of delivery</u>						
Total sample						
S.V.D.	62.5*	58.7	60.2	61.3	53.2	60.9
L.U.S.C.S.	63.4*	59.7	61.1	62.1	54.9	61.5
Other	63.1	60.1	61.7	62.6	54.1	62.8
Children with no sibs < 5						
S.V.D.	63.3	60.2	62.1	63.4	53.8	62.4
L.U.S.C.S.	63.6	61.2	61.9	63.2	55.6	63.0
Other	63.3	60.2	61.9	62.5	54.2	62.8
<u>Labour analgesia and anaesthesia</u>						
Total sample						
None/inhal.	62.4	58.5	60.3	62.0	53.2	61.0
Analgesia + L.A./Spinal.	62.6	59.1	60.5	61.6	53.3	61.5
General anaesthesia	63.1	59.5	61.0	61.6	55.4	61.4
Children with no sibs < 5						
None/inhal.		Not calculated			-	-
Analgesia + L.A./Spinal.	63.4	60.4	62.1	63.3	54.1	62.5
General anaesthesia.	63.2	60.2	61.4	62.0	54.2	62.8

Social score - cont.

	Main sample				Prelim.sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
<u>Apgar count</u>						
Total sample						
1 min. 9-10	62.3	58.5	59.7	60.5	-	-
1 min. 7-8	62.8	59.4	60.7	62.5	-	-
1 min. <7	61.9	58.4	59.5	59.4	-	-
2 min. 9-10	62.8	59.4	60.8	62.6	-	-
2 min. 7-8	63.4	60.3	63.3	63.6	-	-
2 min. <7	63.7	60.4	61.6	61.8	-	-
<u>Care in first 48 hours of life</u>						
Total sample						
Routine care	62.7	59.0	60.4	61.5	53.4	61.0
$>O_2$, nursed with mother.	62.3	58.6	60.5	63.2	52.7	61.0
Cot nursed.	63.0	61.0	64.7	64.2	53.8	61.5
$>O_2$ and cot nursed.	62.5	59.0	58.8	60.6	54.6	62.8

SEX, BIRTH WEIGHT AND LENGTH OF GESTATION.

Distribution of the samples by sex.

	Male	Female	Total
Main sample			
4 weeks	98	70	168
16 weeks	84	63	147
28 weeks	89	65	154
40 weeks	89	64	153
52 weeks	83	60	143
Preliminary sample			
40 weeks	40	57	97
52 weeks	28	44	72

Distribution of the samples by birth weight.

	Birth weight				
	4lb 8oz -	6lb 9oz-	7lb 11oz-	8lb 13oz+	Total
Main sample					
4 weeks	27	73	52	16	168
16 weeks	24	64	45	14	147
28 weeks	22	68	48	16	154
40 weeks	22	66	49	16	153
52 weeks	20	62	46	15	143
Preliminary sample					
40 weeks	32	30	23	12	97
52 weeks	23	25	15	9	72

Distribution of the samples by length of gestation

	Length of gestation			
	36 weeks -	39 weeks-	41 weeks+	Total
Main sample				
4 weeks	18	111	39	168
16 weeks	17	95	35	147
28 weeks	15	104	35	154
40 weeks	15	104	34	153
52 weeks	15	99	29	143
Preliminary sample				
40 weeks	15	66	16	97
52 weeks	11	49	12	72

Distribution of the mean values of the developmental scores by sex, birth weight and length of gestation.

PHYSICAL SCORE

	Main sample				Prelim. sample
	4 weeks	16 weeks	28 weeks	40 weeks	40 weeks
Sample Mean	63.4	54.0	49.2	69.8	68.6
Sex					
Male	63.6	53.7	49.5	69.9	68.5
Female	63.1	54.3	48.9	69.8	68.7
Birth weight					
4lb 8oz -	63.1*	53.3*	48.8	69.3	68.4
6lb 9oz -	63.6	53.1	48.6	69.7	69.5
7 lb 11 oz -	62.5	54.6	49.7	70.3	67.7
8lb 13 oz +	65.7*	57.1*	49.9	69.9	68.9
Length of gestation					
36 weeks -	63.5	53.7	49.0	71.2	68.8
39 weeks -	63.3	54.2	49.3	69.6	68.6
41 weeks +	63.6	53.6	48.9	70.2	68.5

SIT WALK SCORE

	Main sample			Prelim. sample	
	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	41.3	43.8	44.2	43.6	43.8
Sex					
Male	41.4	43.8	44.3	43.7	43.1
Female	41.2	43.9	44.0	43.6	44.3
Birth weight					
4lb 8oz -	40.0*	42.9	43.2	42.9	42.6
6lb 9oz -	41.2	44.0	44.0	45.8	46.2
7lb 11oz -	41.8	43.8	44.4	42.3	41.6
8lb 13 oz +	42.3*	44.7	45.4	46.6	44.0
Length of gestation					
36 weeks -	40.3	46.1	43.8	42.0	45.6
39 weeks -	41.2	43.6	44.1	44.1	44.1
41 weeks +	42.0	43.4	44.6	43.5	41.0

HAND EYE SCORE

	4 weeks	16 weeks
Sample mean	31.7	28.7
Sex		
Male	31.6	28.7
Female	31.9	28.7
Birth weight		
4lb 8oz -	30.8*	27.9*
6lb 9oz -	31.8	28.6
7lb 11oz -	31.7	29.0
8lb 13oz +	33.1*	29.2*
Length of gestation		
36 weeks -	30.8*	27.6
39 weeks -	31.7	28.9
41 weeks +	32.2*	28.7

TABLE TOP SCORE

	Main sample				Prelim. sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks.
Sample Mean	16.6	84.6	83.3	84.5	83.0	84.0
Sex						
Male	16.5	84.3	83.6	84.6	83.4	84.9
Female	16.7	84.9	82.9	84.3	82.8	83.3
Birth weight						
4lb 8oz -	16.0	83.2	83.4	84.0	83.2	83.7
6lb 9oz -	16.6	84.3	82.1	84.2	83.4	83.8
7lb 11oz -	16.9	85.5	84.3	85.2	82.3	83.1
8lb 13oz +	16.2	84.7	84.8	83.8	82.9	86.1
Length of gestation						
36 weeks -	16.0	83.4	86.6	85.5	84.1	86.4
39 weeks -	16.6	84.8	83.6	84.5	83.3	83.6
41 weeks +	16.6	84.4	80.9	83.8	81.1	82.6

SOCIAL SCORE

	Main sample				Prelim. sample	
	16 weeks	28 weeks	40 weeks	52 weeks	40 weeks	52 weeks
Sample Mean	62.7	59.1	60.5	61.5	53.5	61.1
Sex						
Male	62.9	59.1	60.6	61.5	52.7	60.8
Female	62.4	59.1	60.4	61.5	54.0	61.2
Birth weight						
4lb 8oz -	61.9*	59.2	60.0	61.5	53.3	61.3
6lb 9oz -	62.5	59.0	60.1	61.3	53.9	61.2
7lb 11oz -	63.0	59.2	61.0	61.6	53.2	61.2
8lb 13 oz +	63.7*	59.2	61.0	62.1	53.6	59.8
Length of gestation						
36 weeks -	62.3	59.0	62.0	63.3	53.2	61.7
39 weeks -	62.6	59.1	60.5	61.4	53.7	61.4
41 weeks +	63.0	59.1	59.9	60.9	52.7	58.9

APPENDIX 7

THE RELATIONSHIPS BETWEEN THE DEVELOPMENTAL SCORES AT EACH AGE LEVEL

Correlation matrix of the scores obtained at the 4 week examination.

Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.39**	0.14
Total Hand Eye		1.00	0.25**
Social			1.00

* $p < .05$ ** $p < .01$

Correlation matrix of the scores obtained at the 16 week examination.

Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.45**	0.39**
Total Hand Eye		1.00	0.40**
Social			1.00

Correlation matrix of the scores obtained at the 28 week examination.

Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.43**	0.44**
Total Hand Eye		1.00	0.42**
Social			1.00

Correlation matrix of the scores obtained at the 40 week examination of the main sample

Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.41**	0.30**
Total Hand Eye		1.00	0.68**
Social			1.00

Correlation matrix of the scores obtained at the 40 week examination of the preliminary sample.

Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.18	0.06
Total Hand Eye		1.00	0.21*
Social			1.00

Correlation matrix of the scores obtained at the 52 week examination of the main sample

	Score		
Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.42**	0.34**
Total Hand Eye		1.00	0.56**
Social			1.00

Correlation matrix of the scores obtained at the 52 week examination of the preliminary sample.

	Score		
Score	Total Physical	Total Hand Eye	Social
Total Physical	1.00	0.43**	0.36*
Total Hand Eye		1.00	0.45**
Social			1.00

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